Appendix B
Table of Contents

Department of Environmental Protection
Bureau of Remediation & Waste Management
LUST Program

Standard Operating Procedure Change Record

Title: Collection of Household Water Samples Protocol

Identification #: DR#001

SOP Originator: Brian Beneski

Author	Revision Number	Description of Change	Date
Deb Stahler	TS 02	Substitute MEDEP/Lust Program in the place of MEDEP/DR Section 2.0 Introduction: Change first sentence to "MEDEP/LUST Program is responsible for investigation and remediation of soil and water contaminated with gasoline and fuel oil from leaking underground storage tanks." Section 5.0 Guidelines/ Procedures: GRO samples must be preserved with HCl to pH<2 and chilled to 4^{o}C. DRO samples should also be preserved using sodium bisulfate or HCl to ph<2. Include the attached steps to minimize interference of plumbing grease in DRO samples. Section 7.0 Documentation: All sampling events must be documented in a field notebook or field note forms. Chain of custody forms must be completed, and a completed, signed copy retained in the project file.	11/01/02

Approved by:

Bruce Hunter, Hydrogeologist Date

George Seel, LUST Program Director Date:

Recommended DRO Sampling Guidelines for Minimizing Plumbing Grease Interference

For obtaining unfiltered water sample for DRO analysis:

- First, determine if there is any type of filter or softener on the system. Visually inspect in the basement and under the kitchen sink. Check with homeowners to see if they have recently used their water that day (i.e. showers, laundry etc.)
- If not, allow water to purge until you hear water pump come on at least twice (so we know that water sampled is from the well and not plumbing).
- If there is no filter, remove the aerator from the kitchen faucet and purge lines for 5 minutes (do not adjust flow between purging and sampling). Sample for DRO first. **DO NOT ADJUST WATER FLOW**. This can release mineral grease into the sample, thus causing a false positive for DRO. To sample for GRO [or other test] you may adjust water flow as necessary after obtaining the DRO sample.
- If there is a filter or softener then you must sample from the plumbing system prior to the filter or softener system. Typically this is done at the pressure tank boiler valve, using the [Alex Pugh] sampling device. Attach device to the boiler valve next to the pressure tank and attach a fresh piece (2-3 feet) of tubing to it. Turn valve on so that a steady laminar flow of water is coming out. Have one team member hold the tubing and bucket, the other sample. Allow water to flow for 5 minutes. Sample for DRO first. **DO NOT ADJUST WATER FLOW**. To sample for GRO [or other test] you may adjust water flow as necessary after obtaining the DRO sample. Remove sampling device and decontaminate before next use.

Sampling From Granular Activated Carbon Systems:

- Open all sample port valves and purge 3 to 4 gallons through each valve.
- Collect samples for DRO without any adjustments to the valve – do not increase or decrease flow
- Decrease flow for GRO and other sample parameters.

COLLECTION OF HOUSEHOLD WATER SAMPLES PROTOCOL

Maine Department of Environmental Protection

Division of Site Remediation

Standard Operating Procedure: **DR#001**
REVISION: **#5**
DATE: **December 23, 1998**
Written/Revised by: Brian Beneski
Reviewed by: Denise Fournier

1.0 PURPOSE

The purpose of this document is to describe the Maine Department of Environmental Protection, Bureau of Remediation and Waste Management, Division of Remediation's (MEDEP/DR) procedure for collecting water samples from household wells at or near uncontrolled hazardous substance sites.

2.0 INTRODUCTION

MEDEP/DR is responsible for the investigation and remediation of uncontrolled hazardous substance sites throughout Maine. In the course of the investigation and subsequent remediation, samples must be taken to determine the geographical extent, chemical characteristics, and relative levels of contaminants at each site and the surrounding area. This standard operating procedure (SOP) is designed to be a guideline for collecting water samples from household wells (dug, drilled, etc.) either with or without filtration devices.

Sampling household water supplies is essential to the proper investigation of groundwater contamination at a potential/ actual hazardous waste site. Each well supplying a household(s) also represents a monitoring well for local groundwater. Such information/data must be factored into the groundwater investigation program.

The three most important aspects of household water sampling are as follows: 1) develop a sample plan that adequately and appropriately meets the sampling goal (see also SOP DR#014-Development of a sampling plan); 2) follow established sampling procedures to ensure the integrity of the sample, and; 3) keep accurate records of sampling data (i.e. locations, bottle numbers, etc.).

3.0 RESPONSIBILITIES

All Uncontrolled Sites Program Staff must follow this procedure when performing activities involving the collection of water samples from household wells. All Managers and Supervisors are responsible for ensuring that their staff are familiar with and adhere to this procedure.

4.0 DEFINITIONS

-- Treatment System - A device which removes volatile compounds from water by volatilizing the contaminants out of the water (such as an air stripper), or a

device packed with granular activated carbon which removes contaminants by adhesion from the water as the water passes over and through the granular activated carbon.

-- Sample Point - Any location from which a representative water sample may be obtained.

5.0 GUIDELINES/PROCEDURES

5.1 Preparation

Sampling plan development guidance can be found in SOP DR#014 – Sampling Plan Development. However, residential sampling does require several unique aspects, the most important being scheduling. All residents should be informed at least one week ahead of the scheduled sampling event, particularly if access to filters or air strippers is required. Be aware of the past contamination history of the site and try to plan visits so that sampling begins with the least contaminated households and ends with the most contaminated households. This method allows the least potential for cross-contamination, and should be followed whenever practical. Allow at least twenty (20) minutes between each sampling appointment. Also, if this is an initial visit to a household, bring a well data sheet (Attachment X) and get as much information about each household's well(s) as possible. Important information/data to gather when sampling household wells includes: date of installation of the well; the type of well (drilled, dug, point, or other); gallons per minute produced; depth to the screened interval (and width of screened interval if applicable), and type of piping used.

5.2 Equipment

Below is a list of recommended equipment to have when household sampling:

-- Bucket(to collect excess water when sampling filters)
-- Gloves(to prevent exposure and/or cross-contamination)
-- Flashlight(to enter dark basements/cellars)
-- Field Notebook(to record pertinent information)
-- Chain of Custody Forms(to document chain-of-custody)
-- Label Tags(to label sample ports at households with filters)
-- Container with Deionized Water(for rinsing)
-- Container with Soapy Water(for washing)
-- Sampling Containers from laboratory

5.3 Health and Safety

Part of completing a successful household sampling assignment is completing it in a safe and healthful manner. Whenever sampling water from any point, at a minimum wear latex gloves. Latex gloves decrease the chance of dermal exposure and also reduce the chance of cross-contamination of samples. In cases where the raw water(unfiltered) is suspected or known to be contaminated, wear a chemical-resistant outer glove(i.e. nitrile, PVC, neoprene) that is resistant to the contaminants suspected or present.

Also be aware of physical hazards; filters are usually located in the basement, so make sure to take a flashlight. Watch for overhead hazards such as low ceilings and/or hanging objects. Be especially careful of electrical hazards such as outlets near the sampling area and/or bare wires. Lastly, try not to splash the water when sampling; splashing contaminated water in the eyes or on exposed skin could be harmful if the water is significantly contaminated. If water supplies are known or suspected to be grossly contaminated, the sampler should wear chemical resistant goggles/glasses. As a conservative approach, assume all water being sampled is contaminated until proven otherwise.

5.4 Sampling

5.4.1 Sampling Households Without Treatment System

When sampling at a household with no filters on the water system, take the sample from an indoor faucet (kitchen, bathroom, other) or an outside spigot, preferably from the closest spigot to the well in the plumbing system. Make sure that the sample point is clean (i.e., no grease, lead soldering, or other possible contaminants) and that no possible sources of cross-contamination (gas cans, solvents, etc.) are nearby. If other water treatment systems such as radon or sediment filters or water softeners have been put on the water system, the sample should be collected prior to these systems. If sampling from a kitchen faucet, remove the aerator; if sampling from an outside spigot, remove any hoses or attachments to the spigot. Run the water on cold at full flow for least ten(10) minutes.

Running the water will accomplish two goals. First, it will purge the pipes of any stagnant water; second, it will drain the pressure tank and cause the pump to turn on and start pumping the well. This should assure the collection of a fresh and representative sample from the well.

While the water is running, record the number(s) on the sample container(s) in a field notebook and note any observations and/or comments about matters pertinent to the sample and/or site. Put on appropriate gloves. To the extent possible, attempt to avoid contact with water that is suspected or known to be grossly contaminated.

After the water has run for at least ten minutes, reduce the flow to a trickle and obtain a sample using the appropriate containers. Each analysis has its own specific requirement for the volume of water to be collected. Fill and preserve the containers in the way prescribed by the laboratory performing your analyses.

After you have taken all the required samples, turn off the water and replace any removed parts (aerator, hose, etc.). With the gloves still on, wipe and dry the samples with a paper towel (if necessary), and, if appropriate for the sample parameters, place in an iced cooler for transport to the laboratory. Remove the gloves from your hands and dispose of them properly (as stated in the Sampling Plan, see SOP DR#014). Wash your hands with a soap/water solution and rinse them with deionized water before proceeding to sample at the next site. A new pair of gloves must be worn at every residence.

5.4.2 Sampling Households With GAC Filters

For households with filters, as mentioned previously, sample in order from the least contaminated sample point to the most contaminated sample point. Therefore, sample the post-, mid-, and pre- sampling points to insure the smallest chance for cross-contamination. Also be aware that some systems have additional filters/strippers/softeners before the first granular activated carbon (GAC) filter, and obtain the sample prior to these systems. Make note of such additions to the system in your field notebook.

Begin sampling by turning the cold water on at one of the household taps full volume, and running the water for at least 15 (15) minutes. This will purge not only the pipes, but also the GAC filters. While the water is running, record the sample bottle numbers in your field notebook, and collect any equipment that may be useful when sampling before and between the filters (bucket, flashlight, etc.). Chemical protective gloves compatible to the suspected or known contaminants should be worn.

When sampling, decrease the water flow to a very slow rate (this prevents excessive spray and also reduces volatilization); fill the containers in the way prescribed by

the laboratory. If sampling from a sink faucet, be sure to remove any aerators on faucet.

The between filter sample should be taken next. Run this sample port water ten to twenty seconds prior to sampling to remove any residue/contaminants from the port. Use a bucket to catch the excess water produced when running the water and taking the sample. Once again, gloves must be worn to prevent cross-contamination of the samples.

The sample before the filter system is taken last due to its highest probability of being contaminated. Run the sample port water ten to twenty seconds to remove the residue/contaminants from the port. The bucket will again be necessary to catch excess water from this sampling port. Gloves will be necessary not only to prevent cross-contamination of samples, but also to protect the sampler from dermal exposure.

If multiple treatment systems exist, it may be necessary to take more samples. Many air-strippers have ports (spigots) both before and after the stripper expressly for the purpose of taking samples. Filtration devices can often be bypassed with bypass valves included in the plumbing. When sampling any of these devices, trace the route of the plumbing (pipes) to make sure the sample is being taken from the correct sampling port. Be sure to include contingencies for such devices in the sampling plan.

Once all the samples have been collected from a residence, remove gloves, and return all plumbing to its original position (aerator back on faucet, all sample ports closed). Record water meter readings if the residence is equipped with a meter. Be sure to note if the meter reading is in cubic feet or gallons. The water meter reading will give (in conjunction with the previous reading) the amount of water being used by the household, which is useful in predicting/explaining the breakthrough in GAC filters. Add any necessary preservatives to the samples and place the samples in a cooler on ice for transport to the laboratory. Wash your hands before proceeding to the next household to be sampled. Again, a new pair of gloves should be worn at every residence.

6.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

In order to insure that the samples are representative of the water at a given sampling point, the sampler must pay close attention to QA/QC procedures. At each household the sampler must be aware of four (4) areas which may be sources of cross-contamination of the samples: 1)gloves--wear a new pair at

every residence sampled; 2)sampling point--sample at the least contaminated households first, the most contaminated last; 3)self-contamination--make sure the sampling area is free of any possible sources of contamination(grease on the tap, solvent bottles near the sample port), and; 4)piping--look at the plumbing and pipe materials and note the presence of lead soldering or improper lubrication (i.e. WD-40, oil, etc.) on the pipes. Also, ask the resident if any work had recently been done on the well, plumbing, or any other components of the water system.

Perhaps the most important QA/QC procedure that must be part of every sampling event is the inclusion of a trip blank in the cooler. This trip blank should be collected from the laboratory doing the analysis, preserved with the same preservative as the actual samples, stored and transported with the other samples collected during the sampling event, and then analyzed (along with the other samples) for the appropriate suspected contaminants by the lab. If a sampling event is completed and the trip blank contains contaminants, this indicates that the containers may not have been clean or other QA/QC procedures have failed. In this case, it may be necessary to re-sample. Consult with the project manager and laboratory personnel before re-sampling a site.

Sampling personnel must use common sense prior to and during sampling activities in order to avoid problems. For instance, samplers should try to avoid gassing up a vehicle on the day of the sampling event. Avoid the use of colognes, perfumes and bug sprays on sampling days. Wash hands thoroughly prior to any sampling activities. In addition, sampling personnel should avoid any contact with inside surfaces of sample containers and covers or caps.

In the event that problems occur, such as contamination between filters (and not before or after), check all possible sources of error before arranging to re-sample the household. Recheck all field documentation from the trip to insure the sample numbers were recorded correctly in both the field notebook and on the laboratory analysis request sheet and/or chain of custody. Talk with the person(s) completing the analysis in the laboratory and ask about possible sources of error. If the documentation check fails, go back to the site and re-sample. When re-sampling, be sure to check the plumbing to make sure all valves are properly opened and closed. An open bypass valve would bypass the filters and supply unfiltered raw water to the house.

In some instances, a household may have contamination before the filter and between the filter. In this case, the between filter spigot should be re - sampled and analyzed as soon as possible in order to confirm the breakthrough of the first GAC

filter, or the first filter should be changed or repacked as soon as possible. If the determination has been made that the first filter has contaminant breakthrough, then arrangements should be made to have the filter replaced and/or repacked with carbon. Whether to resample or change filters is a decision to be made following consultation with the project manager.

7.0 DOCUMENTATION

Sampling at a household is only as good as the records kept of the sampling event. Records should be kept in a field notebook in the manner described in the SOP DR#013, as well as a Site Event Trip Report, also described in SOP DR#013.

8.0. REFERENCES

U.S. Environmental Protection Agency, "A Compendium of Superfund Field Operations Methods," EPA-540/P-87/001, December 1987.

U.S. Environmental Protection Agency, "Sampling of Hazardous Materials," EPA, April 1990.

Department of Environmental Protection
Bureau of Remediation & Waste Management
LUST Program

Standard Operating Procedure Change Record

Title: Groundwater Sampling Using Low Flow Purging and Sampling

Identification #: DR#003

SOP Originator: Brian Beneski

Author	Revision Number	Description of Change	Date
Deb Stahler	TS 01	Substitute MEDEP/Lust Program in the place of MEDEP/DR Section 2.0 Introduction: Change first sentence to "MEDEP/LUST Program is responsible for investigation and remediation of soil and water contaminated with gasoline and fuel oil from leaking underground storage tanks."	1/25/02

Approved by:

Bruce Hunter, Hydrogeologist Date

George Seel, LUST Program Director Date:

GROUNDWATER SAMPLING USING LOW FLOW PURGING AND SAMPLING PROTOCOL

Maine Department of Environmental Protection

Division of Site Remediation

Standard Operating Procedure: **DR#003**
REVISION: **#2**
DATE: **August 14, 2001**
Written/Revised by: Brian Beneski
Reviewed by: Troy Smith

1.0 PURPOSE

The purpose of this document is to describe the Maine Department of Environmental Protection, Bureau of Remediation and Waste Management, Division of Site Remediation's (MEDEP/DR) procedure for collecting groundwater samples from wells utilizing the "Low Flow" purging and sampling procedure.

2.0 INTRODUCTION

MEDEP/DR is responsible for the investigation and remediation of uncontrolled hazardous substance sites throughout Maine. In the course of these investigations, samples must be taken to determine the geographical extent, chemical characteristics, and relative levels of contaminants at and in the vicinity of each site. This standard operating procedure (SOP) is designed to be a guideline for MEDEP/DR staff for collecting groundwater samples from monitoring wells using the low flow (minimum stress) purging and sampling procedure (LFS). This procedure is based on current research and field experience by MEDEP personnel. In addition to this SOP, it is recommended that personnel performing LFS review the published articles on this technique listed in Section 12, References, before attempting to perform the procedure for the first time.

3.0 RESPONSIBLITIES

LFS is the recommended methodology for obtaining groundwater samples from properly installed monitoring wells. Unless specific instances do not allow using low flow methodology, all MEDEP/DR staff must follow this procedure when performing groundwater sampling activities. The field staff in MEDEP/DR and geological support staff in MEDEP/Technical Services (MEDEP/TS) in particular must be well versed in LFS. Their managers and supervisors are responsible for ensuring that they receive adequate training, are familiar with, and adhere to this procedure. Other staff members who may assist with LFS will receive training on an as needed basis.

4.0 OVERVIEW OF LFS

The goal in any groundwater monitoring activity is to collect ground water samples that are "representative" of mobile organic and inorganic loads in the vicinity of the selected open well interval. Current research indicates that LFS is the best available technique for obtaining the most representative samples of groundwater from the formation surrounding the screened interval of a properly installed monitoring well.

LFS includes both a purge and no-purge option. The purge option for LFS involves pumping the well at a rate approaching ambient groundwater flow in order to minimize disturbance of the sampling zone and mixing of the riser water. Field parameters, such as pH and conductivity are monitored during purging until readings have stabilized; at this point (theoretically), groundwater entering the pump intake represents formation water and the sample is collected.

In low permeability formations or poorly installed monitoring wells it may not be possible to collect groundwater samples using the specified purge techniques. In such instances, the no-purge option should be evaluated.

Additionally, this procedure is not designed to collect samples from wells containing light or dense nonaqueous phase liquids (LNAPLs or DNAPLS).

LFS is a skill which requires considerable experience and ongoing education and tuning on the part of those who perform it; therefore, at least one experienced person in LFS should always accompany every sampling team.

5.O EQUIPMENT

The following list of equipment is necessary when performing LFS. Specific brand names indicate equipment owned by either MEDEP/DR and MEDEP/TS, and is available to staff for use. Deviations from this list must be indicated on the site specific sampling plan (see SOP DR#014, Development of a Sampling Plan).

Use of trademarked names does not imply endorsement by MEDEP/DR & /TS, only to identify the specific equipment owned by MEDEP/DR & /TS.

5.1 Pump

The pump selected must have capabilities of adjusting the flow rate without the use of flow restrictors. Types of acceptable pumps include: submersible and inertial pumps. The use of inertial pumps(e.g.peristaltic pumps) is permissible for most situations where the contaminants of concern have appropriate vapor pressures. Physical limitations on the use of peristaltic pumps also apply to wells with deeper water levels; wells with water levels greater than approximately 24 feet cannot be sampled with a paristaltic pump. In these instances, a submersible pump should be used.

Pumps available to MEDEP/DR personnel include Grundfos® submersible pumps, Fultz® submersible pumps, and Geotech® peristaltic pumps. Specific manufacturers' instructions are kept with the MEDEP/DR field staff, or the MEDEP/TS Geologist Technician.

The Department recommends the use of dedicated equipment, where possible, for long term monitoring plans.

5.2 Tubing

The goal in proper tubing selection is to maximize the tubing diameter, while minimizing the tubing length. Polyethylene is acceptable for all types of sampling. One quarter (¼) inch inside diameter (ID) tubing is the standard size used in conjunction with peristalitic pumps. Three eighths (3/8) inch ID tubing is the size used with the submersible pumps.

As in the case with pumps, the use of dedicated tubing, where possible, will be used for long term monitoring programs.

5.3 Power Supply

The power supply includes a generator, deep cycle battery, or nitrogen tank for running the pump(s). The Fultz and Geotech pumps owned by the MEDEP/DR/TS can be operated by deep cycle battery (the Fultz requires an electrical converter supplied with the pump). The Grundfos requires a

generator. If a gasoline generator is used, it must be located downwind and at a safe distance from the well so that the exhaust fumes do not contaminate the samples. The operator of the generator should not handle the sampling equipment or sample containers.

5.4 Indicator parameter monitoring instruments

The analyses necessary for LFS are listed below.

-- pH (EPA Methods 150.1 or 9040),
-- turbidity (EPA Method 180.1),
-- specific conductance (EPA Methods 120.1 or 9050),
-- temperature (EPA Method 170.1),
-- Oxidation Reduction(Eh), and
-- dissolved oxygen (EPA Method 360.1).

A flow-through cell is required for dissolved oxygen and Eh measurements.

5.5 Water Level/Flow Measuring Tools

Water level and flow measurement are required for LFS. Several different water level meters, including Solinist® and Well Wizard®, are available to staff. A graduated cylinder and stopwatch are used for measuring flow in mL/minute.

5.6 Documentation Supplies

This includes a field notebook for taking field notes, and LFS data sheet, which can be found in attachment A.

5.7 Well Documentation

A well's location, well construction, previous sampling data, and the Sampling and Analysis Plan (SAP) should accompany samplers in the field.

5.8 Miscellaneous Supplies

Miscellaneous supplies include decontamination equipment and material, sample bottles, preservation supplies, sample tags and labels.

6.0 LFS PURGE AND SAMPLE PROCEDURE

6.1 Preparation

Prior to conducting a low flow sampling event, information regarding well construction, development, and water level records for each well to be sampled should be obtained and reviewed to determine the appropiate pump to be used, locating the intake, and the potential groundwater recharge rate of the well. If this information is not available, a reconnaissance should be made prior to the actual sampling event to determine well depth, water level, lenghth of screen, and an pump test to determine the recharge rate of the well. Additionally, wells that have not been sampled for two years should be redeveloped prior to conducting the actual sampling event.

6.2 Field Procedure

Obtain static water level. Measure and record the depth to water (to 0.01 ft) in the well to be sampled before any disturbance to the well. Care should be taken to minimize suspension of any particulates attached to the sides or at the bottom of the well.

Install sampling pump or tubing. It is highly preferable that sampling tubing and pumps be dedicated to wells. However, in situations where dedicated equipment is not used, field staff will lower equipment., i.e., pump, safety cable, tubing and electrical lines, slowly into the well so that the pump intake is located at the center of the saturated screened interval (information regarding well construction must be included with sampling plan). When conducting sampling events at sites in which both peristaltic and submersible pumps are used, it is best to plan to install the submersible pumps, then collect samples from “peristalticable” wells, then return to sample the wells with submersible pumps. If the sampling event is multiple day, then submersible pumps should be installed in wells to sit overnight. Collection of turbid free water samples may be difficult if there is three feet or less of

standing water in the well. A water level indicator is next lowered to the top of groundwater.

When starting the pump, slowly increase the pump speed until a discharge occurs. Check water level. Adjust pump speed until there is little or no water level drawdown. It is best to concentrate on the flow rate and water level stabilization before connecting the flow cell or obtaining any other measurements. Air captured in the tube can usually be removed by elevating the discharge tube and pump to allow the air to continue rising until discharged with the water. Subsequent sampling rounds will probably have intake settings and extraction rates that are comparable to those used in the initial sampling rounds; check previous data sheets to assist in well set up and establishing flow rates.

Monitor water level and pumping rate every three to five minutes during purging. Record pumping rate adjustments and depths to water. Adjustments are best made in the first fifteen minutes of pumping in order to help minimize purging time. If the recharge rate of the well is less than minimum capability of the pump do not allow the water level to fall to the intake level (if the static water level is above the screen, avoid dewatering the saturated screen). If a constant water level can not be maintained at a flow rate of 80 to 100 mL/min., the no-purge option should be evaluated(see Section 9.0 No-Purge Option).

During well purging, monitor field indicator parameters every three to five minutes. Purging is complete and sampling may begin when all field indicator parameters have stabilized (variations in values are within ten percent of each other, pH +/- 0.2 units, for three consecutive readings taken at three to five minute intervals). Measurements of dissolved oxygen and Eh must be obtained using a flow-through cell. Samples for laboratory analyses must be collected before the flow cell. This can be done by disconnecting the flow cell after reaching stabilization, or by providing a sample port before the flow cell. If any measurements are missing, the resulting sampling data may not be acceptable. The current approved data sheet for low flow sampling can be found in Attachment B.

VOC samples are preferably collected first and directly into preserved sample containers. Fill all sample containers by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence. Preserve all

samples (if applicable) immediately after they are collected.

LFS will help eliminate turbidity caused by improper purge and sampling techniques. The need for filtering water samples will be reduced by using this method. However, if turbidity values equilibrate above 30 NTUs, one should consider the need to collect both a filtered and an unfiltered sample. The use of an in-line filter is preferred. An in-line 0.2-0.45 um particulate filter should be pre-rinsed with approximately 25 - 50 mL of groundwater prior to sample collection, or as per filter manufacturers instructions. **Note that filtered water samples are not an acceptable substitute for unfiltered samples when the monitoring objective is to obtain chemical concentrations representative of total mobile loads.**

After collection of the samples, any tubing used may either be dedicated to the well for resampling (by hanging the tubing inside the well), decontaminated, or properly discarded.

7.0 PROCEDURE EVALUATION

The purpose of the LFS purge option is to sample the groundwater from the surrounding aquifer. If your well is not receiving sufficient recharge from the formation, the water level in the well will drop as pumping continues. This means that the discharge water could contain a significant percentage of stagnant water from the well casing. As the percentage of casing water increases, the representativeness of the sample decreases. If the percentage of casing water is significant, an alternative sampling technique, such as the No – Purge Option, should be considered (see Section 9). A Decision process for implementing low flow/no purge sampling can be found in Attachment A.

The second step in evaluating the viability of LFS for a potential no - purge well is to determine the volume of groundwater needed to fill the laboratory containers. Compare this volume to the volume of groundwater in the screened section of the monitoring well. If the volume of water contained in the screened zone is greater than the volume of sample required to fill the sample containers, then the no-purge option is appropriate for this well.

7.1 Calculating Formation/Stagnant Water Ratio

The following calculation will determine how much of the water being pumped is coming from the well, and how much is coming from the aquifer. This is done by comparing the total volume being purged to the drawdown volume in the well. If the equilibrium flow rate is 150 mL/min or lower for a given well, the following evaluation should be followed:

-- Calculate the total volume of water discharged for a given time interval.
-- Measure the total drawdown of the water level in the well during that time interval.
-- Calculate the total drawn down volume in the well.(For a two inch diameter well there are ~660 mL/foot.)

Compare the total volume of water discharged to the total drawdown volume. If the drawdown volume comprises 60% or more of the discharge volume, the well construction should be evaluated.

7.2 Well Construction Evaluation

Evaluate the well construction. Was the appropriate screen slot size selected? Was the appropriate filter sand selected? If the well construction details are not appropriate for the formation then consideration should be given to installing a new, properly designed well. A poorly designed well will not yield representative samples no matter what purging procedure is utilized.

Any sampling of wells that have not been used for more than three years should be reconnoitered to determine if re-development is necessary before attempting to sample with LFS.

8.0 PROCEDURE MODIFICATIONS

The LFS procedure can be modified to meet the Data Quality Objectives for the Sampling Event. In long-term monitoring events it may be possible to reduce the field parameter list after baseline information is obtained over the first year or two. Careful consideration should be given to the purpose of each parameter used in the procedure. Each

parameter has importance that extend beyond the measurement for equilibrium.

Cold weather considerations must be factored into a low flow sampling plan.

Monitoring wells with recharge rates below 100 mL/min may not be capable of being pumped at a continuous rate. Therefore, low purge or no purge options should be considered.

9.O NO – PURGE OPTION

The theory of no-purge sampling is that the water in the screened zone is in equilibrium with the aquifer and the water in the riser portion of the well is not. The goal is to sample only the water in the screened zone and to minimize any mixing with the water in the riser.

In certain low permeability formations it may not be possible to maintain a constant drawdown at low flow rates(~80-100 mL/min.). In these formations the only option may be to obtain a groundwater sample without purging.

9.1 No-Purge Procedure

The same principle applies to the no-purge option that apply to the purge option. Dedicated equipment is required to properly complete this procedure(to eliminate any additional mixing of the water in the riser with the water in the screen).

The pump intake must be in the screened zone, at or slightly above the midpoint of the screen.

Calculate the volume of water standing in the discharge line.

Turn on the pump at the lowest possible flow rate.

Purge the volume of water that was standing in the discharge line.

Immediately begin sample collection after the discharge line is purged.

10.0 DOCUMENTATION

A field log must be kept each time ground water monitoring activities are conducted in the field; the LFS Data Sheet in Attachment B is the approved form for use by staff. The

field log should document the following:

-- Well identification, condition of well
-- Static water level
-- Pumping rate, or flow rate including units
-- Time of all measurements
-- Water Level at the specified pumping rate
-- Indicator parameters values
-- Well sampling sequence and time of sample collection.
-- Types of sample bottles used and sample identification numbers.
-- Preservatives used.
-- Parameters requested for analysis.
-- Name of sample collector(s).

Calibration information of meters should also be documented.

11.0 DECONTAMINATION

Dedicated equipment will not need decontaminating. However, non dedicated equipment should be cleaned prior to field work, after each sampling location, and upon return to the office from the field. Non dedicated tubing should be discarded. The pump, including support cable and electrical wires which are in contact with the well will be decontaminated by one of the procedures listed below.

The decontaminating solutions can be pumped from either buckets or short PVC casing sections through the pump or the pump can be disassembled and flushed with the decontaminating solutions. It is recommended that detergent and isopropyl alcohol be used sparingly in the decontamination process and water flushing steps be extended to ensure that any sediment trapped in the pump is flushed out. The outside of the pump and the electrical wires must be rinsed with the decontaminating solutions as well. The procedure is as follows:

-- Flush the equipment/pump with deionized or tap water. Flush pump by allowing pump to run with water for several minutes in basin filled with water.

-- Flush with non-phosphate detergent solution for several minutes.

-- Flush with deionized water to remove all of the detergent solution. In some instances of high levels of contamination, it may be appropriate to use isopropyl alcohol in this step. The need for this will be determined in the Site Specific Sampling and Analysis Plan (See SOP DR#014)

-- Flush one final time with distilled/deionized water. If required (as determined in Site Specific Sampling and Analysis Plan), collect equipment blank after final flushing.

12.0 REFERENCES

Backhus, D.A., Ryan, J.N., Groher, D.M., MacFarlane, J.K., Gschwend, P.M., 1993; Sampling Colloids and Colloid-Associated Contaminats in Ground Water; Ground Water, Vol 31, No. 3, pp. 466-479.

Barcelona, M.J., Wehrmann, H.A., Varljen, M.D., 1994. Reproducible Well-Purging Procedures and VOC Stabilization Criteria for Ground-Water Sampling; Ground Water, Vol 32, No.1, pp. 12-22.

Garske, E.E., Schock, M.R., 1986. An Inexpensive Flow-Through Cell and Measurment Sysytem for Monitoring Selected Chemical Parameters in Ground Water. GWMR, Summer.

Herzog, B.L., Chou, S.J., Valkenburg, J.R., and Griffin R.A., 1988. Changes in Volatile Organic Chemical Concentrations After Purging Slowly Recovering Wells. *Groundwater Monitoring Review*, v.9, no.3, pp 93-99.

Kearl, P.M., Korte, N.E., Cronk, T.A., 1992. Suggested Modifications to Ground Water Sampling Procedures Based on Observations from Colloidal Borescope. GWMR, Spring, pp 155-161.

Powell, R.M., Puls, R.W., 1993. Passive Sampling of Groundwater Monitoring Wells Without Purging: Mulitlevel Well Chemistry and Tracer Dissappearance. Journal of Contaminant Hydrology, Volume 12, pp 51-77.

Puls, R.W., Powell, R.M., 1992. Acquisition of Representative Ground Water Quality Samples for Metals. *Groundwater Monitoring Review*, v.12, no.2, pp 167-176.

Puls, R.W., Powell, R.M., 1992. Transport of Inorganic Colloids through Natural Aquifer Material. Environmental Science Technology, Vol 26, pp614-621.

Puls, R.W., Powell, R.M., Clark, D.A., Paul, C.J., 1990. Facilitated Transport of Inorganic Contaminants in Ground Water: Part I, Sampling Considerations. Enviromental Research Brief, EPA-600-M-90-023, December

Puls, R.W., Powell, R.M., Clark, D.A., Paul, C.J., 1990. Facilitated Transport of Inorganic Contaminants in Ground Water: Part II, Colloidal Transport. Enviromental Research Brief, EPA-600-M-90-023, December

Puls, R.W., Barcelona, M.J., 1989. Ground Water Sampling for Metals Analyses. Superfund Ground Water Issue, EPA-540-4-89-001, March.

Shanklin, D.E., Sidle, W.C., Ferguson, 1995. Micro-Purge Low-Flow Sampling of Uranium-Contaminated Ground Water at the Fernald Environmental Management Project. Groundwater Monitoring Review, Summer.

USEPA, 1992. RCRA Ground-Water Monitoring: Draft Technical Guidance; EPA/530-R-93-001; U.S. EPA; Office of Solid Waste; Washington, D.C. PB93-139-350.

USEPA, 1993. Solid Waste Disposal Facility Criteria: Technical Manual; EPA/530-R-93-017; U.S. EPA; Office of Solid Waste; Washington, D.C. PB94-100-450.

ATTACHMENT A
DECISION PROCESS FOR IMPLEMENTING LOW FLOW/NO PURGE SAMPLING

Decision Process for Implementing LFS

1) Obtain well construction, development, and water level records for each well being sampled. Compile total depth, screened interval, water level, and available hydraulic conductivity information for field technician(s).
   Continue to 2

2) Review available equipment. Make sure the pump is capable of variable speeds and can pump water at low rates without the use of mechanical flow restrictions. Reducing flow by altering the diameter of the discharge pipe is not acceptable for purposed of LFS. Make sure the chamber being used to collect field parameters is appropriate for the parameters being measured. For Eh and DO measurements with probes, the chamber must be an enclosed chamber that does not allow water to contact the atmosphere and does not impact the water quality. Additionally, the size of the chamber should be appropriate given the expected flow rates.
   Continue to 3

3) The objectives of the sampling event should be reviewed to determine the important stabilization parameters as well as the important field parameters for geochemical analyses.
   Continue to 4

4) Is the well being used as part of a long-term plan to monitor trends in groundwater chemistry?
   Yes … Go to 5
   No … Go to 6

5) Complete Well Performance Evaluation on Well prior to first sampling event.
   Continue to 6

6) Will water level (under pumping conditions) stabilize above the top of the screen?
   Yes … Go to 11
   No … Go to 7

7) Is the static water level above the top of the screen?
   Yes … Go to 9
   No … Go to 8

8) Will the stabilized water level reduce the volume of water in the well by greater than 10%?
   Yes … Go to 12

No … Go to 11

9) Is there sufficient water in the well to purge and sample the well given the measured drawdown rate without dewatering any part of the screen?
   Yes … Go to 10
   No … Go to 12

10) Is the volume of water attributable to the change in water level greater than 20% of the volume of water being discharged during the same time period?
   Yes … Go to 12
   No … Go to 11

11) Complete the Standard Low Flow Sampling Procedure and collect groundwater samples once the selected stabilization parameters have equilibrated.

12) Evaluate the appropriate application of Reduced Purge Procedures for this well.
   Continue to 13

13) Is the sampling equipment (pump or sample tube) dedicated to the well and/or has it been installed for more than 2 weeks prior to sampling?
   Yes … Go to 15
   No … Go to 14

14) Install the pump or tubing and purge a volume of water equal to 1.5 times the volume required to fill the laboratory containers. Purging must be completed at the lowest setting possible (must be less than 100 mL/min). Then shut-off the pump and allow the well to recharge until the water level returns to the static water level
   Continue to 15

15) Set the pump rate to the lowest possible setting (must be lower than 100 mL/min) and purge a volume of water equal to the volume of water in the sample tube. Then immediately begin collection of laboratory samples at the same rate. Record the water level at the beginning of sample collection and at the end of sample collection. If field parameters are to be collected, they must be collected after laboratory samples are collected.

Department of Environmental Protection
Bureau of Remediation & Waste Management
LUST Program

Standard Operating Procedure Change Record

Title: Protocol For Collecting and Handling of Soil and Sediment Samples for Volatile Organic Analysis

Identification #: DR#005

SOP Originator: Brian Beneski

Author	Modification Number	Description of Change	Date
Deb Stahler	TS 01	Substitute MEDEP/Lust Program in the place of MEDEP/DR Section 2.0 Introduction: Change first sentence to "MEDEP/LUST Program is responsible for investigation and remediation of soil and water contaminated with gasoline and fuel oil from leaking underground storage tanks." Section 7.0 Documentation: All sampling events must be documented in a field notebook or field note forms. Chain of custody forms must be completed, and a completed, signed copy retained in the project file.	1/25/02

Approved by:

Bruce Hunter, Hydrogeologist Date

George Seel, LUST Program Director Date:

PROTOCOL FOR COLLECTION AND HANDLING OF SOIL AND SEDIMENT SAMPLES FOR VOLATILE ORGANIC ANALYSIS

Maine Department of Environmental Protection
Division of Site Remediation

Standard Operating Procedure: **DR#005**
Revision: **1**
Date: **March 28, 2000**
Written by: **Brian Beneski**
Reviewed by: **Jean Firth**

1.0 PURPOSE

The purpose of this document is to describe the Maine Department of Environmental Protection, Bureau of Remediation and Waste Management, Division of Remediation's (MEDEP/DR) procedure for collecting and handling soil/sediment and other "solid" material for volatile organic compound (VOC) analysis.

2.0 INTRODUCTION

MEDEP/DR is responsible for the investigation and remediation of uncontrolled hazardous substance sites throughout Maine. In the course of the investigation and subsequent remediation, samples must be taken to determine the geographical extent, chemical characteristics, and relative levels of contaminants at each site and surrounding area. This standard operating procedure (SOP) is designed to be a guideline for containerizing solid matrix VOC samples that will be analyzed using USEPA proposed methods 5035 and 5021. These particular methods require that samples collected in the field be preserved at the time of collection through either chemical (methanol or sodium bisulfate) or physical (freezing) means. This SOP will outline the procedure for preservation using both methods.

3.0 RESPONSIBILITIES

All Uncontrolled Sites Program Staff must following this procedure when collecting solid matrix samples for VOC analysis. All managers and supervisors within MEDEP/DR are responsible for ensuring that their staff are familiar with and adhere to this procedure.

4.0 PROCEDURE FOR CHEMICAL PRESERVATION

4.1 Preparation

Prior to conducting any sampling event, a sampling plan should be developed (see SOP DR#014 - Development of a Sampling and Analysis Plan). The Maine Department of Health and Human Services' Health and Environmental Laboratory (HETL) will be providing all VOC analysis services to MEDEP/DR. A copy of their Quality Assurance Plan can be found in the MEDEP/DR's Quality Assurance Plan (QAP). HETL will be providing appropriate containers for analysis; prior to conducting any sampling HETL will be contacted and appropriate containers procured from the lab. If another laboratory other the HETL is used, the laboratory must use the same method as HETL for analysis and provide MEDEP/DR a copy of there SOP for conducting the analysis. Fresh containers must be obtained from the laboratory for each sampling event.

4.2 Equipment

Equipment required for solid VOC sampling include:

-- Sampling device - This includes shovels, Geoprobe soil boring system, dredges, etc, as outlined in the site specific sampling plan. Please refer to the following MEDEP/DR SOPs for using this equipment:

-- DR#004 - Sampling Surface Water and Sediment
-- DR#006 - Soil Sampling
-- DR#007 - Soil Sampling with a Geoprobe Large Bore Sampler

-- Sample collection syringe - A disposable open barrel (without Luer - tip end) plastic syringe for sampling, or a Terra Core™ sampler. A five (ml) syringe is required; larger syringe sizes will not fit into the vial and therefore make containerization impossible. Syringes having rubber or other elastomer seals are not acceptable. Syringes with rubber seals can have the rubber seal removed prior to use.

-- Sample containers - Three containers will be provided by the lab:

1) One 40 ml VOA vial, containing sodium bisulfate preservative and a clean teflon magnetic stirring bar. There should be enough sodium bisulfate to ensure a sample pH of < 2; therefore 1 gram will be added for a five gram sample. The container with preservative and stirring bar must be pre weighed by the laboratory to nearest hundredth of a gram, with tare weight written on container label. Note: when using sodium bisulfate as a preservative, acetone may be formed and samples with carbonates will cause foaming when added to vial.

2) One 40 ml VOA vial, containing 10 ml of methanol and a clean teflon coated magnetic stirring bar. The container with preservative and stirring bar must be pre weighed by the laboratory to nearest hundredth of a gram, with tare weight written on container label.

3) An additional container for conducting dry weight analysis. The only requirement for this container is that it be able to contain at least 10 grams of sample. A plastic whirl pack container will suffice.

-- Field balance - optional.

4.3 Sampling Procedure

1) Prepare sampling syringe and containers for use. Visually confirm presence of preservative, stirring bar, and tare weight on container. Retract plunger of the coring syringe leaving barrel space for the desired soil sample volume (approximately 3.5 ml). To assure that the sample is as close to five grams as possible, it is recommended the a

"test" soil sample be collected and weighted on the field balance to determine the appropriate amount in the syringe to collect.

2) Using chosen sampling device, obtain soil sample. Samples should be collected as soon as the soil has been exposed to the atmosphere. Expose the sample site (i.e. open the soil borer, dig hole and expose soil sidewall, open dredge, etc.), and quickly collect the soil sample by pushing syringe into soil until approximately 5 grams of soil is obtained (approximately 3.5 ml on syringe scale). When obtaining samples with trowels, shovels, and backhoes, it is preferred that the sample be obtained directly from the side walls or bottom of the hole or excavation rather than the device itself. **However, personnel must not put themselves at risk; no personnel should be entering any excavation deeper than 4 feet or that would in any way be considered a confined space. Do not put your head in excavations or holes that may contain toxic environments.** In some instances, such as sediment sampling, it is impossible to collect directly from the environment. If collecting a sample from the device (i.e., shovel, ponar dredge) itself, every attempt should be made to obtain the sample from undisturbed soil; i.e. try to keep the soil/sediment as a "clod" in the shovel or backhoe and push the syringe into the undisturbed clod.

3) Transfer soil from syringe into one of the vials provided by laboratory. Clean off outer syringe barrel before putting into vial. Seal immediately. Repeat procedure for second vial.

4) Completely disperse samples in preservative by shaking to produce a slurry. Transport cohesive clay soils that do not disperse well in the field to the laboratory as soon as possible, and instruct the laboratory to disperse the sample by appropriate means (i.e., sonication) immediately upon receipt. Note the need for dispersal on the chain of custody form(s).

5) Collect sample for dry weight analysis. Sampling syringe is not necessary for obtaining this soil; soil may be placed directly into container with trowel or appropriately gloved hand.

6) Place samples in iced cooler. Clean the outside of each sample container before placing in the shipping/storage container. Temperature of cooler should be maintained at approximately 4°C.

4.3.1 Special Requirements for Samples With Expected Low Percent Solids

Samples with high moisture content (and consequently low percent solids) will require a sample mass greater than 5 grams. It is therefore recommended that when samples are anticipated to have percent solids less than 30%, as in the case of sediment samples, an extra vial be procured (in addition to the 3 other containers) from the lab that has enough sodium bisulfate to ensure a pH of <2. A sample size of 15 grams will be collected, therefore 3 grams of sodium bisulfate will be added by the laboratory. This vial must be clearly marked as containing extra preservative. As with the other vials, a teflon coated

metal stirring bar must also be in the vial and the entire container with preservative and stirrer pre weighed by the lab. Sampling procedure will be the same as the other vials, except that the syringe will be used three times in collecting the sample for containerization to obtaining the necessary 15 gram sample. Additionally, free liquid should be decanted from the sample prior to sample collection with syringe when appropriate.

5.0 PROCEDURE FOR PHYSICAL PRESERVATION

5.1 Preparation

Prior to conducting any sampling event, a sampling plan should be developed (see SOP DR#014 - Development of a Sampling and Analysis Plan). The Maine Department of Health and Human Services' Health and Environmental Laboratory (HETL) will be providing all VOC analysis services to MEDEP/DR. A copy of their Quality Assurance Plan can be found in the MEDEP/DR's Quality Assurance Plan (QAP). HETL will be providing appropriate containers for analysis; prior to conducting any sampling HETL will be contacted and appropriate containers procured from the lab. If another laboratory other the HETL is be used, the laboratory must use the same method as HETL for analysis and provide MEDEP/DR a copy of there SOP for conducting the analysis. It is recommended that fresh containers be obtained from the laboratory for each sampling event.

5.2 Equipment

Equipment required for solid VOC sampling include:

-- Sampling Device - This includes shovels, Geoprobe soil boring system, dredges, etc, as outlined in the site specific sampling plan. Please refer to the following MEDEP/DR SOPs for using this equipment:

-- DR#004 - Sampling Surface Water and Sediment
-- DR#006 - Soil Sampling
-- DR#007 - Soil Sampling with a Geoprobe Large bore sampling

-- Sample collection syringe - A disposable open barrel (without Luer - tip end) plastic syringe for sampling, or a Terra Core™ sampler. A five (ml) syringe is required; larger syringe sizes will not fit into the vial and therefore make containerization impossible. Syringes having rubber or other elastomer seals are not acceptable; syringes with a rubber seal can be used if the seal is removed prior to use.

-- Sample containers - Three containers will be provided by the lab:

1) Two 40 ml VOA vial, containing a clean teflon coated magnetic stirring bar. The containers with stirring bar must be pre weighed by the laboratory to nearest hundredth of a gram, with tare weight written on container label.

2) An additional container for conducting dry weight analysis. The only requirement for this container is that it can contain at least 10 grams of sample. A plastic whirl pack container will suffice.

-- Dry ice and freezing cooler. Dry ice requires special handling. Staff may not use dry ice until they have received appropriate training and equipment for handling dry ice.

-- Balance - Optional.

5.3 Sampling Procedure

1) Prepare sampling syringe and containers for use. Visually confirm presence of the stirring bar and tare weight on container. Retract plunger of the coring syringe leaving barrel space for the desired soil sample volume (approximately 3.5 ml). To assure that the sample is as close to five grams as possible, it is recommended the a "test" soil sample be collected and weighed on the field balance to determine the appropriate amount in the syringe to collect.

2) Using chosen sampling device, obtain soil sample. Samples should be collected as soon as the soil has been exposed to the atmosphere. Expose the sample site (i.e. open the soil borer, dig hole and expose soil sidewall, open dredge, etc.), and quickly collect the soil sample by pushing syringe into soil until approximately 5 grams of soil is obtained (5 ml on syringe scale). When obtaining samples with trowels, shovels, and backhoes, it is preferred that the sample be obtained directly from the side walls or bottom of the hole or excavation rather than the device itself. **However, personnel must not put themselves at risk; no personnel should be entering any excavation deeper than 4 feet or that would in any way be considered a confined space. Do not put your head in excavations or holes that may contain toxic environments.** In some instances, such as sediment sampling, it is impossible to collect the sample directly from the environment. If collecting a sample from the device (i.e., shovel, ponar dredge) itself, every attempt should be made to obtain the sample from undisturbed soil; i.e. try to keep the soil as a "clod" in the shovel or backhoe and push the syringe into the undisturbed clod.

3) Transfer soil from syringe into one of the vials provided by laboratory. Seal immediately. Repeat procedure for second vial.

4) Collect sample for dry weight analysis. Sampling syringe is not necessary for obtaining this soil; soil may be placed directly into container with trowel or appropriately gloved hand. Sample must be at least 10 grams in weight.

5) Place samples in cooler for freezing. Clean the outside of each sample container before placing in the freezing/shipping/storage container. Place the samples in the cooler so that an vial is leaning approximate 45° angle and so that the vials are not in direct

contact with dry ice. **Do not place samples for any other parameters in coolers containing dry ice.**

5.3.1 Special Requirements for Samples With Expected Low Percent Solids

Samples with high moisture content will (and consequently low percent solids) will require a sample mass greater than 5 grams. It is therefore recommended that when samples are anticipated to have percent solids less than 30%, as in the case of sediment samples, an extra vial be procured from the lab for collection of an extra sample. As with the other vials, a metal teflon coated stirring bar must also be in the vial and the entire container with stirring bar pre weighed by the lab. Sampling procedure will be the same as the other vials, except that a sample of approximately 15 grams will be collected. Therefore, the syringe will be used three times in collecting the sample. Additionally, free liquid should be decanted from the sample prior to sample collection with syringe when appropriate.

6.0 CHAIN OF CUSTODY

Procedures for chain of custody outlined in MEDEP/DR SOP DR#012 - "Chain of Custody" must be followed.

7.0 DOCUMENTATION

All sampling activities must be documented as outlined in MEDEP/DR SOP DR#013 - Documentation of Field Notes and Development of a Sampling Event Trip Report.

8.0 QUALITY ASSURANCE/QUALITY CONTROL

8.1 QA Sample Collection

Collection and analysis of the following QA samples is mandatory.

-- Trip Blank. One trip blank per sampling event. When using pre - preserved sample containers, a separate trip blank for sodium bisulfate and methanol should be utilized. Trip blanks should travel accompany containers at all times; each sample storage and shipping container should contain a trip blank. The laboratory providing analysis will re responsible for providing the appropriate trip blank.

-- Temperature Blank. A "temperature blank" shall be included in each cooler when utilizing the physical preservation protocol. This blank shall consist of a VOC vial filed approximately 1/3 with water and sealed. It will be placed in the freezing cooler upon leaving and kept in the cooler directly adjacent to the samples as the sampling event occurs. This blank will be visually checked on a periodic basis to assure that the cooler is

freezing samples. More ice will be added to the cooler if the temperature blank is not frozen. Inspections of temperature blank will be documented in field notes.

Any other QA/QC samples as outlined in the site specific sampling and analysis plan and/or site specific quality assurance project plan (see MEDEP/DR SOP DR#014 - "Development of a Sampling and Analysis Plan", and MEDEP/DR SOP DR#017 - "Requirements for the Development of a Site Specific Quality Assurance Project Plan").

8.2 Deviations from SOPs

All deviations from the procedures outlined in this or in any other SOPs followed for VOC sampling must be documented in field notes.

Department of Environmental Protection
Bureau of Remediation & Waste Management
LUST Program

Standard Operating Procedure Change Record

Title: Soil Sampling with the Geoprobe® Large Bore Soil Sampler

Identification #: DR#007

SOP Originator: Brian Beneski

Author	Revision Number	Description of Change	Date
Deb Stahler	TS 01	Substitute MEDEP/Lust Program in the place of MEDEP/DR Section 2.0 Introduction: Change first sentence to "MEDEP/LUST Program is responsible for investigation and remediation of soil and water contaminated with gasoline and fuel oil from leaking underground storage tanks." Section 7.0 Documentation: All sampling events must be documented in a field notebook or field note forms. Chain of custody forms must be completed, and a completed, signed copy retained in the project file.	1/25/02

Approved by:

Bruce Hunter, Hydrogeologist Date

George Seel, LUST Program Director Date:

SOIL SAMPLING WITH THE GEOPROBE®
LARGE BORE SOIL SAMPLER

Maine Department of Environmental Protection

Division of Site Remediation

Standard Operating Procedure: **DR#007**
REVISION: **#1**
DATE: **May 10, 1999**
Written/Revised by: Brian Beneski
Reviewed by: Gordon Fuller

1.0 PURPOSE

The purpose of the document is to describe the Maine Department of Environmental Protection, Bureau of Remediation and Waste Management, Division of Site Remediation (MEDEP/DR) procedure for obtaining soil samples using Geoprobe®'s Large Bore Soil Sampler (LBS).

2.0 INTRODUCTION

MEDEP/DR is responsible for the investigation and remediation of hazardous substance sites throughout Maine. MEDEP/DR utilizes the LBS as an investigative tool. The LBS is a solid barrel, piston-sealed, direct push device that allows the collection of discrete interval samples of unconsolidated materials at depth. In addition to providing soil samples for chemical analysis, the geological characteristics of the overburden can also be logged.

The MEDEP has two methods for advancing the LBS into the soil:

1) A 30 lb. Manual sliding hammer constructed by Geoprobe®; and
2) "The Little White Wagon" (LWW) hydraulic drive rig, constructed by Concord Environmental.

3.0 RESPONSIBILITIES

All MEDEP/DR staff who utilize the LBS for site work are responsible for following the procedure outlined in this SOP. The field staff in MEDEP/DR and geological support staff in MEDEP Division of Technical Services (MEDEP/TS) are staff specifically responsible for using the LBS at hazardous substances Sites. Additionally, field staff must attend training, demonstrate, and maintain proficiency in the use of the LWW.

Other MEDEP/DR staff may perform tasks with the LBS after receiving sufficient training in the use of the LBS, or if accompanied by a MEDEP/DR or /TS field staff member when utilizing the manual hammer for drive. Non field staff are

not allowed to use the LWW unsupervised unless adequately trained, and have demonstrated proficiency in the use of the LWW prior to the field activities.

4.0 EQUIPMENT

A list of equipment necessary for the operation of the LBS can be found in Section 3.0 of Attachment A - Geoprobe Large Bore Soil Sampler SOP. Additional equipment not mentioned in Attachment A includes:

-- Drive mechanism - LWW or Manual Hammer
-- Sample collection equipment - See MEDEP/DR SOP DR#006 - Soil Sampling
-- Decontamination Supplies - See MEDEP/DR SOP DR#017 - Decontamination Procedures

5.0 PREPARATION

Prior to conducting any sampling event, a Sampling and Analysis Plan (SAP) must be developed according to the procedures outlined in MEDEP/DR SOP DR#014 - Development of a Sampling and Analysis Plan.

6.0 OPERATION

There are two distinct operations when using the LBS for soil boring; the “drive” operation, in which the LBS is actually driven into the ground, and the use of the LBS itself. Assembly and operation of the LBS can be seen in Attachment A - Geoprobe® Large Bore Soil Sampler Standard Operating Procedure; Technical Bulletin No. 93-660.

There are two methods available for driving the LBS, the LWW and the manual slide hammer. Operation of the LWW can be seen in Attachment B - Concord Environmental Equipment Little White Wagon Operator’s Manual.

Operation of the manual slide hammer is intuitive.

After using the LBS (and appropriate drive), soil samples should be collected using the procedures outlined in MEDEP/DR SOP DR#006 - Soil Sampling, and chain of custody procedures outlined in SOP DR#012 - Chain of Custody Protocol.

7.0 DOCUMENTATION

Field notes should be recorded as described in MEDEP/DR SOP DR#013 - Documentation of Field Notes and Development of a Sampling Event Trip Report.

8.0 DECONTAMINATION

All equipment should be decontaminated as outlined in MEDEP/DR SOP DR#017 - Decontamination Procedures.

Department of Environmental Protection
Bureau of Remediation & Waste Management
LUST Program
Standard Operating Procedure Change Record

Title: Field Screening of Soil Samples Utilizing the Jar Headspace Technique

Identification #: DR#011

SOP Originator: Brian Beneski

Author	Revision Number	Description of Change	Date
Deb Stahler	TS 01	Substitute MEDEP/Lust Program in the place of MEDEP/DR Section 2.0 Introduction: Replace with: "MEDEP/LUST Program is responsible for investigation and remediation of soil and water contaminated with gasoline and fuel oil from leaking underground storage tanks. This procedure is approved for determination of hydrocarbon content of oil contaminated soils as outlined in Appendix Q of Chapter 691." Section 6.0 Procedure: Include the attached PID/FID calibration setpoints guidance. For key project decisions and site closure, use all procedures listed in Appendix Q of Chapter 691 as attached. Section 7.0 Documentation: All sampling events must be documented in a field notebook or field note forms. Chain of custody forms must be completed, and a completed, signed copy retained in the project file.	11/14/02

Approved by:

_____

Bruce Hunter, Hydrogeologist Date

_____

George Seel, LUST Program Director Date:

Appendix Q: Field Determination of Soil Hydrocarbon Content by Jar / Poly Bag Headspace Technique

1. Introduction. The following is a procedure acceptable to the commissioner for determination of the hydrocarbon content of soils contaminated only by oil and petroleum products. A soil sample is placed in a sealed jar or polyethylene bag and the volatile hydrocarbons are allowed to come to equilibrium with the jar headspace. The headspace hydrocarbon concentration is then measured with a calibrated photo- or flame-ionization (PID or FID) instrument, approved by the commissioner.

2. Applicability. This procedure is intended for estimating gasoline, #2 heating oil, diesel fuel, kerosene, and other chemically and physically similar oil contamination in mineral soils, having water contents between bone-dry and saturation. The procedure is not intended for estimating concentrations of heavy oils, lubricating oils, waste oil, and other low volatility hydrocarbon products. Soil grain size distribution and organic carbon content may effect the partitioning of hydrocarbon between soil, liquid, and vapor phases. Weathering of the hydrocarbon product also will decrease the proportion of volatile and soluble constituents, thereby decreasing instrument response. None of these limitations invalidate the method as a technique for approximation of low-level petroleum hydrocarbon concentrations.

3. Equipment Required.

A. Shovel; trowel;

B. Lab containers (VOA or SVOA) of type and quantity for hydrocarbon to be sampled at expected concentrations;

NOTE: Laboratory should be consulted in advance to determine their needs.

C. Metal dial-type thermometer, -10^{o}C to 50^{o}C;

D. (Jar headspace method only) Glass, wide-mouthed, metal screw-top, 16 oz. jars, with cardboard lid liner removed, and 1/4" hole drilled through center of lid;

E. (Jar headspace method only) Roll of heavy duty aluminum foil;

F. (Poly bag method only) 1-quart, Zip-Lock® type polyethylene bags;

G. Means of measuring 250 gm soil sample, plus or minus 10 gms. (e.g., a "calibrated" container, a "Weight Watchers" spring balance);

H. Photoionization (PID), or flame ionization (FID) instrument approved by the commissioner;

NOTE: A list of approved instruments and their calibration set points is available from the commissioner. The department also has developed a protocol whereby manufacturers of other instruments may generate calibration data for commissioner evaluation and approval. Copies are available from the Bureau of Remediation and Waste Management.

I. Calibration equipment for instrument chosen; and

J. Decontamination equipment including soapy water and clean distilled water in squirt bottles or pressurized canisters.

4. Analytical Procedure.

A. Determine the location at which the sample is to be taken. If possible, identify an uncontaminated location at the same site from which soil of similar texture and moisture content can be obtained, to serve as a field "blank".

B. Measure a 250 gm. sample of the soil into a wide-mouthed jar or polyethylene bag. In so far possible, samples should be mineral soil free of vegetation and stones larger than 1/2" in diameter. Seal the samples immediately in the jars by placing a square of foil over the mouth and screwing on the lid, and the bag by zipping the closure. Sufficient air should be left in the bag so that the instrument can withdraw an adequate headspace sample.

C. Repeat this procedure for three (3) more samples, all gathered within a 2'x2' area.

D. Shake the jars for 30 seconds to thoroughly mix the contents. If bags are used, they may be kneaded until the contents are uniform.

E. Measure the samples' temperature by sacrificing one jar or bag. If necessary, adjust all sample temperatures to between 15^{o}C and 25^{o}C by bringing sample containers into a warm vehicle or immersing in a water bath. In warm weather, samples should be kept in a shaded, ventilated area during headspace development and analysis.

F. Allow at least 15 minutes but not more than 1 hour for soil hydrocarbons to reach equilibrium with the headspace.

G. If samples are to be taken for laboratory analysis, they should be collected and preserved per laboratory protocols at this time. Preferably, these samples should bracket a wide range of hydrocarbon concentrations including the highest and lowest concentration at the site.

H. Warm up and calibrate the PID or FID instrument to be used to the calibration set point determined by the commissioner for the make of instrument in use and the product(s) present at the facility.

NOTES:

1. These calibration set points have been established by testing the instruments against weathered petroleum headspace surrogates. Therefore no conversion of the readings to their benzene equivalent is necessary.

2. The UV source in PID instruments should be cleaned at least weekly per the manufacturer's recommended procedure. Both PID and FID instruments must be recalibrated after four hours of continuous use, as well as at the beginning of field use, since their calibration may drift with battery condition.

I. Shake the jars or knead the bags again for thirty (30) seconds.

J. Measure the samples' headspace concentration. If the jar headspace technique is used, break the foil seal through the drilled hole in the jar lid using a pencil or nail. Insert the instrument's probe about 1/2" into the jar. If using the poly-bag technique, insert the

probe through the bag opening while squeezing the bag tight around the probe. Record the highest reading that remains steady for 1-2 seconds (i.e., that is not due to instrument needle inertia). Repeat this step until all jars have been measured.

NOTE: Both PID and FID instruments withdraw a headspace sample from the jar. In the jar headspace technique, air replaces this sample, diluting the headspace as it is being measured. In the poly bag technique, the bag collapses as its headspace is used by the instrument. In either case it is important to obtain an instrument reading immediately after the seal is broken -- preferably within 10 seconds. Once a jar or bag has been used, it may not be used again, even if sufficient time is allowed to re-establish headspace equilibrium.

K. Repeat all steps at each other location of interest at the site. Finally, repeat all steps for the "field blank" obtained from the uncontaminated location.

L. Average the three readings obtained from each soil sample within each 2'x2' area. Blank results must be reported but must not be used to adjust the readings obtained on other samples.

NOTE: Because calibration set points have been established by testing the instruments against weathered petroleum headspace surrogates, no conversion of the readings to their benzene equivalent is necessary.

DATE: September 8, 1997

TO: All Persons Performing Site Assessments Pursuant To "Regulations for Registration, Installation, Operation & Closure of Underground Oil Storage Facilities (Appendix P of CMR, Chapter 691)"

FROM: George Seel, Director
Division of Technical Services
Bureau of Remediation & Waste Management

SUBJ: Calibration Set Points For Photoionization (PIDs) and Flame Ionization Detectors (FIDs) Used in Field Headspace Determinations at Maine UST and LUST Sites

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The following table gives the set points for various PIDs and FIDs when calibrating with 100 ppm isobutylene span gas. **Only the makes and models of instrument listed below may be used in Maine site assessments, where these are required by Chapter 691.**

The notification level using instruments adjusted to these set points is 100 ppm, regardless of the petroleum product being measured. Instruments calibrated to these set points may also be used to determine compliance with the cleanup standards at Baseline-2 (BL-2) sites, per the *DEP Procedural Guidance For Establishing Standards For The Remediation Of Oil-Contaminated Soil And Groundwater In Maine* ("Decision Tree").

Instruments may be made to read directly, either by by entering the appropriate set point when the calibration routine requests the span gas concentration, or by adjusting the instrument's span until the set point reading is obtained. As an alternative, the instrument may be calibrated to the actual span gas concentration and readings are then multiplied by the set point divided by 100, producing the equivalent result. (e.g., a reading of 35 made with an HNu HW-101 at a gasoline site would be multiplied by 440/100 or 4.4 to produce a corrected reading of 154). Headspace concentrations obtained by either method should not be corrected to "benzene equivalents," as suggested by some instrument manufacturers.

If isobutylene span gas having a concentration other than 100 ppm is used, the set point should be adjusted proportionally (e.g., when calibrating a Thermo 580S using 250 ppm isobutylene, the set points should be multiplied by 250/100 or 2.5, producing set points of 637 and 800, respectively, for gasoline and fuel oil work).

This list is periodically updated as set points are established for additional instruments. For the most current listing, please contact the Division of Technical Services, Bureau of Remediation & Waste Management at (207) 287-2651.

A protocol is also available, whereby manufacturers of unlisted PID and FID instruments can generate validation data for DEP's evaluation. For further information, please contact the Division of Technical Services.

Instruments	**Set Point for**	**Set Point for #2**
PID	**Gasoline Sites**	**Fuel Oil Sites**
HNu PI-101, HW-101, ISPI-101, DL-101	440	520
MSA Photon Gas Detector	225	225
MSA Passport PID II OVM	210	355
MicroTIP MP-1000, HL-2000, IS-3000	225	225
Thermo OVM 580B, 580S	255	320
Environmental Technologies "Determinator"	255	320
Foxboro TVA-1000	265	330
FID		
Thermo OVM Model 680	80	45
Foxboro TVA-1000	90	60

FIELD SCREENING OF SOIL SAMPLES UTILIZING THE JAR HEADSPACE TECHNIQUE

Maine Department of Environmental Protection
Division of Remediation

Standard Operating Procedure: **DR#011**
REVISION: **#1**
DATE: **January 21, 1999**
Written/Revised by: Brian Beneski
Reviewed by: Troy Smith

1.0 PURPOSE

The purpose of this document is to describe the Maine Department of Environmental Protection, Bureau of Remediation and Waste Management, Division of Site Remediation's (MEDEP/DR) procedure for field screening volatile organic content of soils using a "Jar Headspace Technique" (JHT) with a photoionization detector (PID) or a flame ionization detector (FID).

2.0 INTRODUCTION

MEDEP/DR is responsible for the investigation and remediation of uncontrolled hazardous substance sites throughout Maine. The procedure described in this procedure will provide a screening tool for determining relative levels of volatile organic compounds (VOCs) present in soil with a field PID or FID instrument. This methodology is not to replace actual laboratory analysis; it is to provide a screening tool in the field for determining "hot spots" and other areas of high or low concentrations of VOCs presence in soil, or for when choosing samples from a site for laboratory analysis.

In conducting this procedure, a soil sample is placed in a sealed jar or polyethylene bag and the volatile constituents are allowed to come to equilibrium with the jar headspace. The headspace is then measured with a calibrated PID or FID, with a result expressed in parts per million (ppm). Due to the different ionization potentials of various compounds, actual levels of contamination cannot be determined. However, this technique provides an effective means of screening soil to determine "hot spots", extent of contamination, and as a means of screening samples for submittal for laboratory analysis.

3.0 SCOPE AND RESPONSIBILITES

This procedure applies to all staff in the MEDEP/DR who are involved with performing field activities in the investigation of uncontrolled hazardous substance sites. Generally, it is the field personnel of MEDEP/DR and MEDEP/Technical Services (MEDEP/TS) (the Oil and Hazardous Materials Specialist positions and Geologist positions) who

will be responsible for performing this task. Project managers of MEDEP/DR can assist and/or perform this task with field personnel present, or after receiving specific training in this activity.

All managers and supervisors are responsible for ensuring that staff who are responsible for performing this procedure understand and adhere to it for all events.

4.0 EQUIPMENT

The following equipment is required for conducting the JHT:

-- Soil sampling equipment (shovel, bucket auger, soil borer;
-- Wide mouthed, metal screw top 16 oz jars, with cardboard lid liner removed, and ¼ inch hole drilled through center, and roll of heavy duty aluminum foil; **or**
-- One quart, zip lock type polyethylene bags;
-- PID or FID – MEDEP/DR personnel has use of the following PIDs:
    -- Foxboro TVA-1000B Toxic Vapor Analyzer with PID, a second TVA-1000B is available from MEDEP/TS with dual PID and FID;
    -- Thermo Environmental Instruments 580 organic vapor monitor;
    -- HNU PID,
    -- Photovac Microtip PID (MEDEP/TS owned)

    (The manuals for these instruments can be found with the OHMS Staff); and
-- Calibration equipment, including users manual, for particular PID or FID to be used.

5.0 PROCEDURE

1- Collect the soil sample, as outlined in the site specific Sampling and Analysis Plan (SAP)(See SOP DR#014 - Development of a Sampling and Analysis Plan) with appropriate soil sampling equipment.

2- Place approximately 250 grams of the soil sample into a wide mouth jar or polyethylene bag, as stated in the SAP. One or the other should be consistently used at the site for comparison purposes, do not mix headspace containers. In so far as possible, samples should be

mineral soil free of vegetation and stones larger than ½ inches in diameter. If soil samples are of different type (loam, sand, silt), this should be identified in the field log book. If a duplicate sample is to be submitted to the laboratory for analysis, this sample should be containerized and preserved as appropriate **now**. Soil that has been screened with JHT should not be submitted for laboratory analysis, unless so documented. If using jars, the jars should be sealed now by placing a square of foil over the mouth and screwing on the lid. If using a bag, the bag should be zipped closed leaving sufficient air in the bag so that the instrument can withdraw an adequate headspace sample.

3- Shake the jars for 30 seconds to thoroughly mix the contents. If bags are used, they may be kneaded until the contents are uniform.

4- Allow at least fifteen minutes but not more than two hours for VOCs to reach headspace equilibrium with the headspace. An attempt should be made to allow the same amount of equilibration time for each sample.

5- Warm up and calibrate the PID and FID instrument to be used according to the manufacturers recommended procedure (See Section 7 - Additional Considerations With Use of PID/FID). The PID and/or FID should be ready for use prior to collection of the first sample.

6- Shake jars/knead bags again for thirty seconds.

7- Measure the samples headspace concentration with the instrument. If the jar is used, break the foil seal through the drilled hole in the jar lid, and insert the probe approximately ½ inch into jar. If using the poly bag, open the seal just enough to insert the probe (this is easiest using two people). Record the highest reading on the instrument after allowing the probe to "sniff" the container for 10 – 15 seconds. It is important to obtain insert the probe as quickly as possible after the seal to the container has been broken. Once a jar has been used, it may not be used again for JHT screening.

7.0 ADDITIONAL CONSIDERATIONS WITH USE OF A PID/FID

The are limitations of PIDs and FIDs. A PID and FID cannot detect all VOCs, nor do they detect all VOCs equally. Factors that influence the response of the particular compound include ionization potential of compound, particular energy rating of lamp, calibration standard used, response factor, response curve, etc. In some instances, such as when the contaminant of concern is a single known compound, it is possible to calibrate the instrument so that a relatively accurate measurement, when compared to laboratory analysis, can be obtained. Because of this, it is recommended that the operator of the particular instrument that will be conducting JHT take the time before the sampling event to familiarize themselves with the particular instrument that will be used, if they are not already familiar with that instrument. This includes reviewing the specific user manual, and calibration and practice with the instrument prior to the sampling event.

6.0 DOCUMENTATION

Field notes should be collected following the standard procedures outlined in SOP DR#013 - Documentation of Field Activities and Development of a SETR. It is important that documentation include the specific lamp energy rating, calibration standard, and special response factors or curves that may be employed for the particular sampling event. When documenting such a sampling event, one should include enough information so that a person at a latter date can easily conduct the same sampling and receive the same results.

Department of Environmental Protection
Bureau of Remediation & Waste Management
LUST Program

Standard Operating Procedure Change Record

Title: Documentation of Field Notes and Development of a Sampling Event Trip Report.

Identification #: DR#013

SOP Originator: Brian Beneski

Author	Revision Number	Description of Change	Date
Deb Stahler	TS 01	Substitute MEDEP/Lust Program in the place of MEDEP/DR. Section 3.0 Responsibilities: Substitute MEDEP/Lust Program in the place of Uncontrolled Sites. Section 5.4 Reference to Other Field Log Forms: Add Chain of Custody Records. Section 6.0 SETR: Remove section	1/25/02

Approved by:

Bruce Hunter, Hydrogeologist Date

George Seel, LUST Program Director Date:

DOCUMENTATION OF FIELD NOTES AND DEVELOPMENT OF A SAMPLING EVENT TRIP REPORT

FOR

MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION'S

DIVISION OF SITE REMEDIATION

Standard Operating Procedure: **DR#013**
Revision: **#3**
DATE: **May 13, 1999**
Written/Revised by: Brian Beneski
Reviewed by: Jean Firth

1.0 PURPOSE

The purpose of this document is to describe the Maine Department of Environmental Protection, Bureau of Remediation and Waste Management, Division of Remediation's (MEDEP/DR) procedure for documenting field actions.

2.0 SCOPE

This procedure applies to all MEDEP/DR staff who participate in conducting field work or site visits and are responsible for documenting the events of these visits. This procedure outlines how field notes must be written to ensure that this information will be acceptable if it is required as evidence in legal proceedings.

3.0 RESPONSIBILITIES

All Uncontrolled Sites Program Staff involved with performing site visits and documenting the activities which occurred are required to follow this procedure. All Managers and Supervisors are responsible for ensuring that their staff are familiar with and adhere to this procedure. MEDEP/DR will provide the appropriate field books; staff will request field books from the OHMS staff in MEDEP/DR as needed; an inventory of field books will be kept in stock.

4.0 DEFINITIONS

Field Notebook - Bound books with water resistant pages in which information from field activities is documented.
Field Notes – Information gathered during a sampling event or some other field activity at nearby, or in some other way associated with a known or suspected hazardous substance site.

5.0 GUIDELINES/PROCEDURES

The are several reasons for taking field notes when visiting sites. These include:

-- Noting information in the field for its use, such as recording low flow well field parameters for comparison purposes to determine stabilization;
-- To provide a record of current conditions at a site;
-- To document specific activities at a site;
-- To allow the re - creation of an event by persons not at the site (for comparing data of different events); and
-- To provide a means of reviewing the activities at a site if quality concerns with data collected during the site visit are uncovered.

All field notes should be taken with these mentioned purposes in mind.

All field notes, with the stated exceptions, will be kept in the standard field book issued by MEDEP/DR OHMS.

For field events with multiple personnel present, it is not necessary for each participant to take field notes. The person(s) responsible for taking field notes and completing the Sampling Event Trip report (SETR) will be stated in the Sampling and Analysis Plan (SAP) or Quality Assurance Project Plan (QAP) for the event (See MEDEP/DR SOP DR#014 - Development of a Sampling and Analysis Plan; SOP DR3016 - Development of a Site Specific Quality Assurance Project Plan (QAPP)).

5.1 Initializing Field Book

Upon Receipt of a Field Notebook, enter your name, DEP address, and phone number on the inside front cover. Give field book a specific designation (site name and book number for site specific field books i.e. Joe's Garage, Book 1), or year book number for general field books, i.e. 99 – 1) Then number all pages in order, being sure not to skip pages.

5.2 Site Documentation

Upon arrival at a site, the following information must be written down in the field notes: 1) Date of field activity; 2) Site or project name and location; 3) names of persons visiting site, including who they represent and their positions or roles; 4) time of arrival; 5) weather conditions.

After completing the header, take field observations as necessary.

At the bottom of each page, and at the end of each day or event, sign and date the field book.

Do not doodle on pages or document personal comments. Additionally, only blue or black ink should be used. Pencils must never be used.

Given the variety of circumstances that can be found, it is difficult to provide a minimum for documentation. However, the following list should be considered a guide for documentation:

-- Names of personnel present and organization;
-- The sample event date and time;
-- weather conditions;
-- field measurements (such as PID readings, pH, temperature, etc);
-- sample station location designations, sample container numbers, etc;
-- Specific sample location information, such as depths of sample, tide conditions, soil conditions, water color/conditions, etc;
-- Out of the ordinary events, such as equipment failure, damage to monitoring wells or evidence of tampering, observations of gross contamination, odors, etc;
-- Information the field staff believe may be useful or pertinent at a later date.

The field notebook must be kept organized, legible, and accurate because it may be used as evidence in court proceedings.

5.3 Correcting Errors

Do not scratch out or blacken over error. Place one line through error, initial it, and continue with correct information. Never rip out or otherwise remove a page from a field book.

5.4 Reference to Other Field Log Forms

Some field activities have specific forms for taking notes. If forms are used, a field book entry must be made with reference to the forms used during that event. Currently, the MEDEP/DR and MEDEP/TS have the following forms for notes:

-- Low flow purge and sampling of monitoring wells
-- Soil boring/test pit logs
-- Elevation survey forms
-- Residential water supply survey form
-- Container survey form
-- Well development form
-- Sample log sheet

Copies of these forms can be found in Attachment A. If these forms are used, the field book must reference these forms.

6.0 SAMPLING EVENT TRIP REPORT (SETR)

After each field event, a sampling event trip report (SETR) package must be completed within one week of the event. If the field event has multiple MEDEP/DR staff present, the person responsible for completing the SETR will be stated in the SAP. At a minimum, the SETR will consist of the SETR form completed (found in Attachment B), with photocopies of all field notes taken by all personnel during the event, and copies of chains of custody for samples. It is also recommended that a summary memo to the file be developed and attached to the SETR form which outlines the field events purpose, activities, and outcomes, and other relevant issues.

Once completed, the original SETR package will placed in the Project Site File through Site the Sites' project manager. An additional copy will also be placed in the Site Assessment and Support Services (SASS) Trip Report file which is kept with the MEDEP/DR Quality Assurance Coordinator.

Department of Environmental Protection
Bureau of Remediation & Waste Management
LUST Program

Standard Operating Procedure Change Record

Title: Decontamination Procedures Protocol

Identification #: DR#017

SOP Originator: Brian Beneski

Author	Revision Number	Description of Change	Date
Deb Stahler	TS 01	Substitute MEDEP/Lust Program in the place of MEDEP/DR Section 3.0 Introduction: Replace first sentence with: "MEDEP/LUST Program is responsible for investigation and remediation of soil and water contaminated with gasoline and fuel oil from leaking underground storage tanks. Replace "uncontrolled hazardous substance sites" with "petroleum contaminated sites".	1/25/02

Approved by:

Bruce Hunter, Hydrogeologist Date

George Seel, LUST Program Director Date:

DECONTAMINATION PROCEDURES PROTOCOL

Maine Department of Environmental Protection

Division of Remediation

Standard Operating Procedure: **DR#017**
REVISION: **#2**
DATE: **January 22, 1999**
Written/Revised by: Brian Beneski
Reviewed by: Gordon Fuller

1.0 PURPOSE

The purpose of this document is to describe the Maine Department of Environmental Protection, Bureau of Remediation and Waste Management, Division Remediation (MEDEP/DR) procedure for decontamination of equipment used at uncontrolled hazardous substance sites.

2.0 SCOPE

This procedure applies to all MEDEP/DR staff who are involved with field activities which require the decontamination of equipment. This procedure describes the different levels of decontamination and the specific steps to be followed at each level. This procedure is intended to ensure that field equipment is properly and adequately decontaminated in order to preserve the integrity of data collected with that equipment in the field as well as to protect staff working with the equipment from exposure to contaminants.

3.0 INTRODUCTION

MEDEP/DR is responsible for the investigation and remediation of uncontrolled hazardous substance sites throughout Maine. In the course of the investigation and subsequent remediation, both simple and sophisticated equipment are used to collect samples and gather data pertinent to identifying the characteristics of the site. This standard operating procedure(SOP) is a guideline for the decontamination of all equipment at uncontrolled hazardous substance sites. In addition to this guideline, personnel using a specific piece of equipment for the first time should also review the manufacturers user manual for any equipment specific decontamination procedures recommended by that manufacturer. All user manuals for equipment available to MEDEP/DR personnel are kept with the MEDEP/DR Oil and Hazardous Materials Specialists (OHMS), or with the MEDEP Division of Technical Services (MEDEP/TS) Geologist Technician.

Decontamination is an essential part of a successful field operation. Decontamination is useful and necessary for a variety of reasons. First, decontamination of equipment prolongs the usable life of the equipment; if a bailer is used to sample a well and then properly decontaminated, the bailer can be used in future sampling events at other wells. Decontamination also lessens the potential for cross-contamination of samples. If a hand auger is properly decontaminated after taking a soil sample, the next sample

taken with the auger should be a representative sample for that location. No cross-contamination from previous samples should have occurred. Lastly, proper decontamination of equipment reduces the likelihood of contamination leaving the site and threatening other areas with contamination.

4.0 RESPONSIBILITIES

All MEDEP/DR staff must follow this procedure when performing field activities requiring the decontamination of field equipment. All Managers and Supervisors are responsible for ensuring that their staff are familiar with and adhere to this procedure.

5.0 DEFINITIONS

-- Decontamination - Removing contamination through physical methods, chemical methods, or a combination of both.

-- Photoionization Detector (PID) - An instrument used to detect photoionizable gases in the atmosphere. Each PID has a probe with a lamp that produces a given amount of electron-volts (eV). Compounds with an ionization potential less than the eV value for the PID lamp may be ionized and concentrations quantified against a specific reference standard.

6.0 GUIDELINES/PROCEDURES

Decontamination generally involves three steps: 1) gross contamination removal; 2) field decontamination; 3) secondary decontamination.

6.1 Gross Contamination Removal

If a piece of equipment is grossly contaminated, use appropriate tools/equipment (for example, scraper, bristle brush, sponge, etc.) to remove the excess soil, sludge, and other obvious contamination. While removing the contamination, spray the items of equipment with water or a detergent/water solution. Such spraying (especially from a high pressure sprayer) may loosen the contamination with a minimal amount of effort. Remember that each item used for the decontamination of equipment may also become contaminated and must be appropriately handled, stored, and either decontaminated itself or disposed of. Also be aware that all of the above decontamination procedures should be completed with an appropriate level of personnel protection no more than one level below the level the fieldwork was completed in.

This means no less than level D which includes chemically resistant gloves, boots, overalls, etc.

In addition, the decontamination of equipment generates contaminated rinse liquids, sludges, etc., that potentially may need to be containerized onsite until proper disposal arrangements are made. In some instances, the levels of contamination may be sufficiently low and disposal at a hazardous waste facility may not be necessary. This decision will be made by field personnel on a site by site basis following consultation with the project manager.

Certain items that become grossly contaminated and cannot be practically decontaminated (i.e. small tools and tools with wooden handles) should be disposed of properly. In some instances it is more practical and sensible to dispose of these items properly than to attempt decontamination. Such decisions will be made by the field personnel performing the work activities at the site.

6.2 Field Decontamination

Once the gross contamination has been removed from a piece of equipment, a more thorough cleaning involving detergents (Liquinox® is the standard detergent of MEDEP/DR) and rinses should be done. Brushes, buckets, sponges, polyethylene bags and sheeting, detergent/water solutions, and tap or deionized water (as stated in Sampling and Analysis Plan; see SOP DR#014 - Development of a Sampling and Analysis Plan) are a few of the items necessary for general field decontamination.

The primary steps to take when performing field decontamination of equipment are dependent on what item of equipment is being decontaminated; however, these steps will generally be followed:

(1) disassemble the equipment (if applicable), and place in a bucket or suitable sized basin filled with a deionized or tap water and Liquinox® (or other appropriate detergent);
(2) Scrub the equipment thoroughly with a suitable sized brush;
(3) rinse the inside and outside of the equipment with deionized or tap water.

In some instances, an additional wash with methanol may be required. The need for a methanol solvent wash will be determined on a site by site basis after consultation with the OHMS and project manager prior to the sampling event. A methanol solvent wash may be necessary in the case of sampling in high levels of contamination, or when sampling particularly difficult to clean contamination such as coal tar. The need

for a methanol solvent wash will be stated in the individual site sampling plan developed for the site.

If the equipment is to be reused at another sampling point, an inspection should be made to assure that the equipment is cleaned. If any doubts exist that the equipment has not been thoroughly decontaminated, the item should be cleaned again, or not used. If the equipment is not to be used again, place the equipment in a polyethylene bag for transport from the field to the storage warehouse. Secondary decontamination will take place in the decontamination area of the equipment storage building.

Instruments such as pH meters, conductivity meters, and other instruments which are immersed in a medium also need field decontamination. In many cases, these instruments do not come into contact with the actual "material" that will be collected for analysis. An example would be collection of groundwater samples using "low flow" methodology (Low flow methodology is outlined in SOP DR#003). In instances such as this, a thorough rinsing of the instrument probes would suffice, with secondary decontamination (see section 6.3 below) to follow after the sampling event, when greater care can be taken so the instrument is not damaged.

If the equipment to be decontaminated is delicate, such as a PID or a CGI, care must be taken when decontaminating so the equipment is not damaged. The best way to avoid the need to decontaminate items such as these is to prevent contact with contamination in the first place. Develop a method of wrapping/bagging these instruments in polyethylene sheeting/bags so that contact with contamination is minimized but the performance of the instrument is not adversely effected(i.e. the knobs made inaccessible, the meter covered, etc.).

Good field decontamination is essential to a successful sampling event. If the field decontamination is done properly, then secondary (at the warehouse decontamination center) decontamination is only a precautionary measure.

6.3 Secondary Decontamination

Secondary decontamination is a precautionary procedure designed to remove minute levels of contaminants from the sampling/monitoring equipment. However, gloves resistant to the potential contaminants should still be worn as a personal protection measure.

The procedures for secondary decontamination are dependent upon the item being decontaminated. For equipment(shovels, trowels, bailers, buckets, etc.) that come into direct contact

with contaminated soils, liquids, pure-product, or sludges, the following procedure is recommended:

(1) immerse the item in a warm tap water and detergent solution;
(2) use a soft, bristle brush to scrub the inside and outside of the item thoroughly(if the item is a bailer, use a bottle brush to scrub the inside of the bailer);
(3) rinse the item with warm tap water;
(4) wipe or spray with methanol (if determined to be necessary, the need for methanol decontamination will be addressed on an individual site basis and discussed in the site specific sampling plan;
(5) rinse the item with deionized or tap water, and;
(6) let the items air dry in an area free from possible sources of contamination.

Secondary decontamination of instruments(PID, CGI, pH meter, conductivity meter, etc.) is sometimes difficult but nonetheless necessary. The objective is to decontaminate the outside of the instruments to prevent the spread of contamination. First, moisten a sponge/cloth with warm, soapy water and scrub the outside assembly of the instrument, being careful not to get water in any fixtures such as controls or attachment ports. Next the instrument should be wiped with a clean, deionized water soaked sponge/cloth. Wipe the outside of the instrument with a dry paper towel to remove any moisture.

6.4 Large Equipment Decontamination

For site work involving large equipment, such as backhoes, bulldozers, drill rigs, etc., a site specific decontamination procedure will be required in the Site specific work plan. As a guideline, a thorough brushing, scraping, washing and/or steam cleaning should be completed. Such maximum contact points as tires, treads, buckets, blades, and drill pipe/bits, should be thoroughly decontaminated in an effort to prevent migration of contaminants off the site. At sites where equipment becomes highly contaminated, provisions to collect rinsate water/solutions may have to be made.

6.5 Alternatives

Decontamination is, by its nature, an arduous and painstaking task which is often better to avoid. This Division will exercise the option to avoid decontamination procedures whenever feasible by implementing alternative plans of action. Such alternatives are:

(1) dedicating specific equipment to a specific site(i.e. specific bailers to specific wells) when economically feasible;
(2) using disposable equipment when applicable(drum thieves), and;
(3) wrapping monitoring equipment in plastic bags(or other materials) to protect from contamination. It is important to keep monitoring equipment such as photoionization detectors(PID) or combustible gas indicator(CGI) from contacting soil or liquids at hazardous substance sites. If an instrument(PID or CGI) becomes contaminated it must be decontaminated. By eliminating contact with contamination and/or using disposable equipment, decontamination of equipment may be avoided.

7.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

To insure that decontamination procedures are meeting the expectations/requirements (i.e., removing detectable levels of contamination) equipment blanks must be taken and analyzed as stated in the site specific SAP. For items of equipment that are used for sampling (bailers, trowels, etc.), run blank water (supplied by the lab) through/over the item into an appropriate container for analysis of the contaminant of concern (the last type of contamination the item was used to sample). Items such as pH meters, conductivity meters, PIDs and CGIs must be calibrated after use to insure proper future measurements/readings.

7.1 Trouble Shooting

If a decontamination blank is analyzed and found to contain a contaminant, possible sources of error will have to be investigated to determine whether or not the decontamination procedures were properly followed. Decontamination blanks are taken and analyzed at the discretion of the field personnel involved and/or the project manager. Possible sources of error include: inadequate scrubbing/ washing/ rinsing of equipment; use of contaminated detergents or rinse waters; contact with contaminants after decontamination but prior to sampling, and/or, lab error. As always, personnel should not be wearing cologne, bug repellant, or pumping gasoline on days that they are handling sampling equipment.

With close attention being paid to detail, problems should not arise very often.

8.0- REFERENCES

US DHHS, 1985. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities. U.S. Department of Health and Human Services, Washington, D.C..

US EPA, 1984. Standard Operating Safety Guides. Office of Emergency and Remedial Response, Washington, D.C..

Standard Operating Procedure

Collection and Handling of Soil Samples for Analysis for Gasoline Range Organics

1.0 Summary

This SOP provides a method for sampling and preserving soils by staff of the Maine Department of Environmental Protection, Bureau of Remediation and Waste Management, for analysis for gasoline range organics (GRO). It may also be applicable when sampling for analysis for other volatile organic compounds.

2.0 Purpose

The details provided in this method are intended to reduce losses of GRO during sampling, storage and transport. These include:

- collection by coring to minimize sample disruption,
- preservation by slurrying the sample with methanol (or optionally by maintaining the sample(s) at dry ice temperature) to deter biodegradation and
- isolation by cleaning the cap and vial threads to facilitate tight closure and reduce volatilization, and by using polytetrafluoroethylene(PTFE)-lined lids.

3.0 Scope and Applicability

The techniques described in this SOP are intended for use for GRO in soils. They are mandatory for sampling soils for GRO analysis using any method adopted by the Maine Department of Human Services as applicable for certified analysis. The techniques may be applicable under certain conditions of field sampling for low level and mid level GC/MS analysis, and field screening for GRO in soils.

Managers or supervisors are responsible for ensuring that the staff they supervise are familiar with and adhere to this SOP when performing or procuring soil sampling for GRO analysis.

4.0 Detailed Description of the Method

4.1 Preservative

Samplers shall use methanol (**or** dry ice) to preserve soil samples. The methanol must be appropriate for the purge and trap method of analysis. It is necessary that the methanol be subjected to quality control analysis before use. The target ratio of sample to methanol shall be one-to-one by volume. Results from any sample not preserved by methanol **or** dry ice are, and must be reported as, minimum values. Waste liquid methanol and methanol-preserved samples not submitted for laboratory analysis must be managed as hazardous waste.

4.2 Containers

Samplers shall use clean, quality-controlled, glass containers with PTFE-lined lids. The recommended container volume is 60 mL. The mouth must be wide enough to allow insertion of the coring syringe without contacting the container. It is preferable that the containers be pre-weighed, with the weight recorded on the labels. Containers not pre-weighed must be tared after analysis. The sample plus methanol volume shall not be less than one-tenth of the container volume. When using dry ice as a preservative, take care to minimize headspace.

4.3 Sampling devices (coring syringes)

4.3.1 Use disposable open-barrel (without Luer-tip end) plastic syringes for sampling. Store in clean polyethylene zipper closure bag, or other suitable clean container. Twenty milliliter (20 mL) syringes are recommended for most applications, especially for coarse soils. Ten milliliter (10 mL) syringes are acceptable. Use a clean coring syringe for each sample collected for GRO analysis. Syringes having rubber or other elastomer seals are not acceptable.

4.3.2 Alternatively, reuseable coring devices may be used in lieu of disposable plastic syringes (e.g. stainless steel, PTFE, brass, etc.). The chosen sampling device must be decontaminated before each use.

4.4 Sampling Procedure

4.4.1 Collect samples for GRO analysis as soon as the soil has been exposed to the atmosphere. Respond to any delay by preparing a fresh sampling surface and starting over.

4.4.2 Examples of sample types collected during a sampling event are those from split spoons, Geoprobes®, bucket augers, test pit walls (naturally exposed soil horizons), backhoe buckets or surface grid locations. Expose the sample site (i.e., open the split spoon, scrape the pit wall surface, remove vegetation and top soil from a surface grid location, etc.) and quickly collect the soil sample.

4.4.3 Samplers shall use appropriate personal protective equipment (PPE) for the specific sampling event, including eye protection and methanol-compatible gloves. To prevent cross contamination, samplers shall wear clean gloves for each sample collected.

4.4.4 At each sampling location, prepare a sample for GRO analysis by transferring a soil plug **less than one-half the container volume** to the sample container using a coring syringe. Collect a co-located sample for dry weight determination of the associated GRO sample, if required by your laboratory.

4.4.5 Before coring the exposed soil, retract the plunger of the coring syringe leaving barrel space for the desired soil sample volume. The recommended volume is 10 mL.

4.4.6 Insert the coring syringe into the soil surface far enough to fill the preset barrel space. If the soil medium being sampled does not have adequate depth, or if stones prevent the collection of the total amount desired in a single insertion, repeat the motion until the coring syringe contains the desired volume.

4.4.7 It is recommended that methanol be added to the pre-weighed container before the soil is cored and added. Insert the coring syringe into the mouth of the pre-weighed container and expel the soil plug into the container by pushing the plunger of the syringe. After expelling the soil plug, ensure that the threads and sealing surface of the container are clean. Cap the container securely. (It is not recommended that methanol be added to the sample container after the soil plug because of the possibility of increased volatile loss.)

4.4.8 Completely disperse samples in methanol by shaking to produce a slurry. Transport cohesive clay soils that do not disperse well in the field to the laboratory as soon as possible**,** and instruct the laboratory to disperse the sample by appropriate means immediately upon receipt. Note the need for dispersal on the Chain-of-Custody form.

4.4.9 For the dry ice preservative option, collect and handle the sample(s) as described above with the exception of the addition of methanol. Place sample(s) on dry ice immediately after collection. Maintain samples at dry ice temperature until dispersed in methanol by the laboratory. (Note: Dry ice requires special handling. Do not use without appropriate training and equipment.)

4.5 Sample Storage

To prevent cross contamination, separate all methanol-preserved soil samples from all other samples in a clean shipping/storage container. Clean the outside of each sample container before placing in the shipping/storage container. Neat materials should not be placed in any container used for the transport or storage of environmental samples.

4.6 Sample Holding Times

Maximum holding time for GRO samples is 14 days. Transport samples to the laboratory expeditiously.

4.7 Chain of Custody

Maintain Chain-of-Custody procedures for each sampling event.

5.0 Quality Assurance

5.1 Document all deviations from the procedures described in this SOP, and all choices of elective alternatives, in the field notebook and any subsequent report.

5.2 Compositing of soil samples for GRO analysis is not acceptable.

5.3 Handle and store field QA samples (i.e., trip and field blanks, co-located samples) in the same manner as environmental soil samples.

5.4 Collect background samples when high levels of naturally occurring organic compounds are suspected (e.g., peat and septage).

5.5 Take additional co-located samples for replicate GRO analysis when necessary. The recommended minimum sampling frequency for co-located samples is one for every ten environmental samples collected; at least one per sampling event. Meaningful co-located samples can only be obtained from undisturbed soil horizons.

5.6 Collection and analysis of the following QA samples is **mandatory**:

5.6.1 Prepare one methanol trip blank per field batch when using pre-preserved sample containers. (Not required when dry ice preservation is used.) Each sample storage and shipping container should contain a trip blank. Trip blanks are not required when adding methanol in the field.

5.6.2 Prepare at least one field blank per day per sampling event. If the methanol is added before mobilization, open the container in the field as if adding a sample. If the methanol is added in the field, add it in the same environment and in the same manner as though a sample were being preserved. Take additional field blanks at sample locations where air-borne contamination is specifically suspected. Identify the samples that are associated with each field blank.

5.7 GRO results must be expressed on a dry weight basis, using the laboratory-determined sample dry weight, or when necessary, using the associated co-located sample dry weight. Evaporation of the analyzed sample to dryness is preferred over co-located sample use.

5.8 Request laboratory analysis and results of all QA samples.

5.9 All analytical data for QA samples and environmental samples reported by the laboratory, must appear together in any subsequent report.

Definitions:

A sampling event is a single cycle of mobilization and sample collection, at a single physical site, carried out by a single team of personnel.

Co-located samples are second samples collected as near to and as close in time to first samples as feasible. They are not true replicate soil samples for volatile analytes, because it is not feasible to demonstrate homogeneity of the matrix. A co-located sample represents the best attainable approximation of such a replicate, for the given location and matrix.

Field blanks, for the purposes of this SOP, are samples of methanol from the same source as that used for sample preservation. They are exposed to the atmosphere at the sampling site to serve as a check on air-borne contamination. They are required because methanol is an avid solvent for gasoline range organics.

Trip blanks are sample containers containing methanol from the same source as that used for sample preservation**.** They are preferably prepared by the laboratory**,** alternatively by field personnel in the clean area where the methanol and sample containers are stored, before leaving for the field. Their purpose is to detect contamination of samples associated with transportation and handling and as a check for any contamination in the containers or methanol as received from the supplier.

A field batch of samples (as distinct from a laboratory batch of samples) is a group of samples collected during one sampling event, and stored and transported in a single shipping container, regardless of the number of samples in the group.

OSJSOP/sjm

Department of Environmental Protection
Bureau of Remediation & Waste Management
STANDARD OPERATING PROCEDURE

Title: Indoor Air Assessments for Residences Impacted by Petroleum Vapors.

Identification number: TS-002

Originator: Peter Eremita

Change record:

Author	Revision	Description of Change	Date
Peter Eremita	00	initial release	5/24/00

Approved by: _____ Date: _____
David Lennett, Bureau Director

Department of Environmental Protection
Bureau of Remediation & Waste Management

Indoor Air Assessment for Residences Impacted by Petroleum Vapors

1. PURPOSE

The purpose of this standard operating procedure (SOP) is to specify the recommended procedures for protecting the health of occupants of residences impacted by vapors from oil discharges.

2. SCOPE

This SOP applies whenever an oil discharge is affecting or is likely to affect indoor air quality. The SOP is intended for use by bureau staff and consultants working for the bureau. Sections 5 and 6 of this SOP also are intended for use by responsible parties and their agents who take the lead in the investigation and remediation of an oil discharge.

1. DEFINITIONS. The following terms as used in this SOP have the following meanings:

A. Bureau. "Bureau" means the Bureau of Remediation and Waste Management in the Maine Department of Environmental Protection.

B. DEP. "DEP" means the Maine Department of Environmental Protection.

C. PID. "PID" means photo-ionization detection device.

D. Responsible party. "Responsible party" means a person who could be held liable under 38 MRSA §§552 or 570 for the costs of mitigating vapors from the discharge of oil.

4. RESPONSIBILITIES

A. Response Services staff. Staff in the bureau Division of Response Services are responsible for:

(1) Making the initial determination as to whether an oil discharge is affecting or is likely to affect indoor air quality. This determination may be made by experience or other conventional means such as odor detection, PID screening and occupant complaint.

(2) Advising occupants to leave the residence if they are experiencing discomfort or health effects associated with petroleum vapors. This advice is provided prior to obtaining any indoor air sampling results.

(3) Providing occupants with the DEP "Health Advisory on Indoor Petroleum Vapors."

(4) Informing occupants and responsible parties of their rights, responsibilities and options under bureau administered programs including, as applicable, clean-up options, the third party damage claim program and the Ground Water Oil Clean-up Fund insurance program.

(5) Notifying the Engineering Unit in the Division of Technical Services to request an indoor air assessment and vapor mitigation assistance if needed.

(6) Initiating investigative and corrective action as soon as possible to reduce the level of petroleum vapors in the residence. See mitigation techniques for indoor vapors and explosion hazards, as set forth in the Division of Technical Services "LUST Procedural Guidelines."

(7) Assisting bureau Technical Services staff in collecting air samples for field and laboratory analysis, and in recording information for the "Residential Investigation Data Form."

(8) Managing the emergency response phase of the investigation, clean-up, vapor mitigation and property restoration, and paying costs associated with the emergency response including the indoor air assessment.

B. Technical Services staff. Staff in the bureau Division of Technical Services are responsible for:

(1) Conducting an indoor air assessment and assisting in vapor mitigation as requested by Response Services staff and as detailed in the Field Guidance described in section 5 of this SOP.

(2) Assuming project management upon completion of the emergency response phase by Response Services staff.

C. Director of Technical Services. The Director of Technical Services is responsible for revising the Field Guidelines as called for under section 6 of this SOP.

5. FIELD GUIDANCE

In carrying out their responsibilities under this SOP, bureau staff and consultants should refer to document "Edited/Adapted Field Guideline for Protecting Residents from Inhalation Exposure to Petroleum Vapors" (Field Guidance), dated June, 2000. This is a guideline and is intended to be used in conjunction with the judgment and experience of bureau staff and consultants. Where individual site conditions dictate, the Field Guidance may need to be adjusted. Adjustments should be made only after review by a toxicologist.

The Field Guidance is an edited version of a document prepared for the DEP by Menzie-Cura and Associates in October 1998. The Field Guideline varies from the source document in that the Field Guidance is adapted to reflect existing bureau policies and to focus on field application of the source document. It may be necessary to refer to the source document from time to time to understand the basis for the Field Guideline recommendations. Copies of the source document are kept in each DEP field office for this purpose.

6. REVISION of the FIELD GUIDANCE

The action levels in the Field Guidance are derived from databases and literature available through 1998. As new information becomes available, the action levels may be revised.

The recommenced sample collection and analysis procedures are based on practical and currently available methods. These procedures will be reviewed periodically and revised as appropriate. [VPH fraction methods are recommended when lab analysis is available.] PETER AND GEORGE, THIS BRACKETED SENTENCE SEEMS OUT OF PLACE. SHOULD IT BE IN THE FIELD GUIDANCE?

Revisions to the Field Guidance will be conveyed to bureau staff through division meetings and by posting the revisions on the bureau website:
http://janus.state.me.us/dep/rwm/homepage.htm

7. DATA COLLECTION

A. In order to obtain an understanding of the impacts that petroleum discharges have on indoor air quality, those following this SOP are asked to complete the forms in Appendix B of the Field Guidance as appropriate and submit them along with the results of any laboratory analyses to the Engineering Unit, Division of Technical Services, in the DEP Southern Maine Regional Office (312 Canco Road, Portland ME 04103).

B. In order to determine if a correlation exits between action levels and PID levels, bureau staff and consultants conducting indoor air assessments under this SOP are directed to collect PID readings (calibrated to DEP set points) at the same time and location that samples for laboratory analysis are collected, and to send copies of the both the PID and laboratory analyses to the Engineering Unit, Division of Technical Services, in the DEP Southern Maine Regional Office (312 Canco Road, Portland ME 04103).

Field Quality Control Guidance

Maine Department of Environmental Protection

ME LUST Program

Standard Operating Procedure: Field Quality Control
SOP Number: TS 003
REVISION: 1
DATE: June 20, 2002
Written/Revised by: Deb Stahler
Reviewed by: John Beane

Approval:

George Seel, LUST Program Director date

1.0 APPLICABILITY:

MEDEP LUST Program is responsible for the investigation and remediation of petroleum contaminated sites throughout Maine. Fieldwork for this program may include initial investigation of a reported spill, routine monitoring of an established site, or collecting samples that will be used to support a decision to close a site. The level of quality control needed to meet the needs for the sampling event should be established prior to fieldwork. This SOP is applicable to all phases of LUST Program field sampling.

2.0 PURPOSE

The purpose of this document is to describe the Maine Department of Environmental Protection, LUST Program guidance for collecting and evaluating field quality control samples.

3.0 DEFINITIONS

3.1 GRO: Gasoline Range Organics

3.2 VOC: Volatile Organic compounds

3.3 LUST: Leaking underground storage tanks

3.4 RPD: Relative percent difference, a measure of precision

4.0 RESPONSIBILITIES

All MEDEP LUST Program staff will follow the procedures outlined in this SOP for the collection and evaluation of quality control samples. The project scientist for a site is generally responsible for field quality control, with input from appropriate staff. Their respective supervisors and managers are responsible for ensuring that they are familiar with and adhere to this procedure, and receive the appropriate training and guidance to conduct fieldwork.

5.0 FIELD QUALITY CONTROL GUIDANCE

5.1 Requirements for Quality Control Sample Collection:

Requirements for collection of field quality control samples will depend on the type of site and what data will be used for. Section 5.2 contains general guidelines. Specific requirements should be included in a site work plan as necessary.

For sites that do not require a specific site work plan section 5.2 guidelines should be followed for sampling events that will be used for key project decisions, site closure, and for sampling events used for site monitoring when multiple sample locations are to be sampled.

For occasional sampling including preliminary investigations and routine monitoring of small sites [less than 10 samples] quality control samples are not routinely

required. However, if questions of data quality are raised, confirmation sampling should be undertaken that includes the appropriate quality control samples.

5.2 Collection and Evaluation Procedures:

5.2.1 **Trip Blanks** are taken when sampling for GRO or VOC to ensure that routine sample handling procedures including sample bottle contamination issues do not lead to false positive analyses. One trip blank should be taken to each sampling event/ site.

A trip blank is organic free water placed in sample bottles prior to a site visit. Typically laboratories supply the appropriate trip blank. The trip blank is then transported to the site along with sample bottles, and ultimately back to the laboratory for analysis. Trip blanks must be properly labeled, but are not included as samples on the chain of custody form.

Trip blanks are analyzed when field blank samples indicate a problem, or if field blanks are not collected. Analysis of the trip blank in conjunction with a field blank or equipment blank will help determine where a sample contamination problem originates.

Trip blanks should not contain any analytes of interest at or above the quantitation limit of the test. If trip blank contamination is documented, all positive sample results are suspect, and depending on the level of contamination, may require re-sampling.

5.2.2 **Field blanks** are taken when sampling for all analyses to ensure site conditions do not lead to false positive analyses. One field blank should be taken for each batch of up to 20 samples during a sampling event when taken. Often field blanks are not taken for field events that involve samples from a variety of locations since site conditions at one location may be different from other locations. Field blanks should be taken according to the judgement of the project scientist. Generally if solvent odors are present field blanks should be taken for VOC.

To collect field blanks, analyte free water must be transported to the field, and poured into appropriate sampling bottles on-site. Field blanks should be properly labeled, and identified on the chain of custody record. They are analyzed as samples by the analytical laboratory.

Field blanks should not contain any analytes of interest at or above the quantitation limit of the test. If field blank contamination is documented, all positive sample results are suspect, and depending on the level of contamination, may require re-sampling. Field blank contamination also triggers analysis of the trip blank.

5.2.3 **Equipment Blanks**: When sampling equipment, such as bailers, pumps with tubing, hand augers, etc. is used to collect samples, an equipment

blank is collected to assess decontamination procedures for the equipment. One equipment blank should be taken for each batch of up to 20 samples during a sampling event.

Equipment blanks are not necessary when using dedicated or disposable equipment unless contamination from the constituent materials is suspected.

Equipment blanks should be properly labeled, and identified on the chain of custody record. They are analyzed as samples by the analytical laboratory.

Equipment blanks should not contain any analytes of interest at or above the quantitation limit of the test. If equipment blank contamination is documented, all positive sample results are suspect, and depending on the level of contamination, may require re-sampling.

5.2.4 **Field Duplicates** are taken to assess precision in the field. One field Duplicate should be taken for each batch of up to 20 samples during a sampling event.

When taking aqueous samples, the field duplicate should be taken directly after the sample using the appropriate sample container.

When taking soil samples, GRO and VOC duplicates should be "co-located" that is taken from soil immediately adjacent to where the sample was taken. Other types of samples can be composited. To take composite samples, place enough soil into a container [plastic for metals, and stainless steel for everything else] for both the sample and the duplicate. Mix thoroughly, and fill the appropriate sample containers.

Samples should be labeled and included on the chain of custody record.

Evaluate results by calculating the RPD between the sample and duplicate.

$$RPD = 100 \times (|S - D| \; / \; ((S + D)/2));$$

where: S is the sample concentration; and
D is the duplicate concentration.

Water samples should be within 30% RPD and soil samples should be within 50% RPD. If overall precision is outside criteria, laboratory precision should be evaluated to help determine whether this represents a sampling or analysis issue. Sampling precision should be included in an overall analysis of data quality. If sample results are close enough to a site action level, and will be used to make decisions about closing a site, re-sampling may be indicated. Field duplicate precision information should be included in any data evaluation reports.

5.2.5 Matrix Spikes and matrix spike duplicates are not required field samples, but are useful to assess matrix interference for the site. Matrix spikes are not used for GRO or VOC in groundwater, and are most useful for soil samples. These samples should be collected at the discretion of the project scientist, or according to criteria set up in a site work plan.

For the field sampler matrix spike and matrix spike duplicate collection entails providing enough of the sample so the laboratory can analyze three samples [the sample, a matrix spike, a matrix spike duplicate].

Matrix spike and spike duplicate samples are evaluated by the laboratory for accuracy [percent recovery], and also for precision [RPD]. Criteria used to evaluate these samples are found in the appropriate analytical method.

5.3 Sample Preservation Issues:

5.3.1 All samples should be preserved according to guidelines included in Attachment 1 whenever possible. These guidelines should be strictly met for all sampling events that will be used for key project decisions, site closure, and for sampling events used for site monitoring when multiple sample locations are to be sampled.

5.3.2 It is recognized that due to unforeseen circumstances some samples may need to be taken without proper refrigeration. In these cases, samples should be transported to a lab or an office refrigerator within 4 hours of collection. Sample results that will be most affected by this deviation from guidelines are those for VOC or GRO. In cases where samples are not properly chilled in the field, data quality issues should be evaluated based on sample temperature, time not under refrigeration and use of the data. If data quality does not support project data quality objectives, confirmation sampling may be required.

6.0 REFERENCES

Test Methods for Evaluating Solid Waste, SW 846, third edition, Chapter 1; USEPA, final update III, December 1996

Organics

Test	Method[1]	Sample Size	Type Container	Preservative	Hold Time	Notes
GRO (water)	ME 4.2.17	2-40 ml	G, TLS[3]	cool, 4 C, HCl pH<2	14 Days	trip blank may be needed
GRO (soil)	ME 4.2.17	2-40 ml or 60 ml	G, TLS[3]	Methanol & cool, 4 C -**or**- freeze samples without methanol	14 Days	see GRO in Soil SOP
DRO (water)	ME 4.1.25	1L	Amber G,TLS[3]	cool, 4 C; HCl or sodium bisulfate	7 Days extraction	minimize plumbing grease contamination
DRO (soil)	ME 4.1.25	200g	G,TLS[3]	Methanol; cool, 4 C	14 Days extraction	
SVOC (water)	3510C or 3520C/ 8270C	1L	Amber G,TLS[3]	cool, 4 C	7 Days extraction	minimize phthalate contamination
SVOC (soil)	3540C or 3541/ 8270C	200g	Amber G,TLS[3]	cool, 4 C	14 Days extraction	
PCB in water	3510C or 3520C/ 8082	1L	Amber G,TLS[3]	cool, 4 C	7 Days extraction	
PCB in soil	8082	200g	Amber G,TLS[3]	cool, 4 C	14 Days extraction	3550B extraction may be used with caution
Pesticides in water	3510C or 3520C/ 8081A	1L	Amber G,TLS[3]	cool, 4 C	7 Days extraction	
Pesticides in soil	3540C or 3541/ 8081A	200g	Amber G,TLS[3]	cool, 4 C	14 Days extraction	3550B extraction may be used with caution
Herbicides in water	8151A	1L	Amber G, TLS[3]	cool, 4 C	7 Days extraction	
Herbicides in soil	8151A	200g	Amber G, TLS[3]	cool, 4 C	14 Days extraction	
Volatiles (water)	5030/ 8260B 524.2 [DW]	2-40 ml vials	G, TLS[3]	cool 4 C, HCl pH<2	7 Days 14 Days	trip blank may be needed
Volatiles (soil)	5035/ 8260B	3 samples	encore sampler	cool, 4 C	48 hours	extra sample for % solids
or	5035/ 8260B	3-40 ml vials, 5g in each vial	G, TLS[3]	cool, 4 C; sodium bisulfate soln. in 2 vials and methanol in 1 vial	14 days	acetone may be generated as an artifact extra sample for % solids
or	8260B	3-40 ml vials	G, TLS[3]	freeze	14 days	EPA Region 1 guidance 5g in each vial extra sample for % solids

Attachment 1: SAMPLING CRITERIA FOR METALS AND ORGANIC COMPOUNDS

Metals

Test	Method[1]	Sample Size	Type Container	Preservative	Holding Time	Notes
Dissolved metals	6010B, 6020 or 7000 series	1 L	cube cont.	HNO3 to pH<2	6 Mos.	Filter on site
Total metals in water	6010B, 6020 or 7000 series 200.7, 200.8, & 200.9 for drinking water	1 L	cube cont.	HNO3 to pH<2	6 Mos.	For RCRA 8 1L includes mercury
Total metals in soil	6010B, 6020 or 7000 series	200g	Whirlpack	none	6 Mos.	
Dissolved Mercury	7470A	1 L	cube cont.	HNO3 to pH<2	28 Days	Filter on site
Total Mercury in water	7470A 245.1 [DW]	1 L	cube cont.	Cool 4 C ; HNO3 to pH<2	28 Days	
Total Mercury in soil	7471A	200g	Whirlpack	Cool 4 C	28 days	

TCLP

Test	SW 846 Method	Sample Size	Type Container	Preservative	Holding Time
TCLP-VOC	1311/ 8260B	4 oz	G, TLS[3]	cool, 4 C	NA
TCLP-Metals	1311/ 6010B or 7000 series	4 oz	G	none	NA
TCLP – herbicides	1311/8151	1 L	G, TLS[3]	cool, 4 C	NA

MISC.

Test	SW 846 Method	Sample Size	Type Container	Preservative	Holding Time
Reactive Sulfide & Reactive Cyanide	SW846 Chapter 8 section 3	2- 4 oz jars	G	none	NA
Flash point	1010, 1020A	4 oz	G, TLS[3]	cool, 4 C	NA
pH[2]	9040A, 9041A, 9045B for soil	4 oz	G	none	NA
Maine Waste Oil Parameters [4]		2 4 oz amber jars	G, TLS[3]	none	NA

Notes:

1. Sw 846 methods, except as noted
2. For situations where the material is very light (e.g. fly ash, feathers, etc.) please provide more material than a 4-oz jar.
3. TLS = Teflon lined cap
4. Maine Waste Oil Parameters include PCBs, flash point, total Halogens, arsenic, cadmium, chromium, and lead